WORKING PLAN

OF THE

TEHRI-GARHWAL LEASED FORESTS,

JAUNSAR FOREST DIVISION,

NORTH-WESTERN PROVINCES AND OUDH.

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INTRODUCTION.

It has been found that deodár forests whose resources are drawn on for the first time, and where costly export works are required, can only be worked remuneratively on a large scale, and that, in consequence, large working circles have to be formed. The present plan, therefore, when it prescribes that the Tehri leased forests, with the exception of the Lambatách and Dátmir forests, shall be worked through in 20 years, regards them as forming a portion only of a large working circle, the precise composition of which cannot be determined until the remaining deodár forests in the Jaunsár Division have been valued. In fact, there seems no good reason for treating them apart from the other forests, as the British Government has a right to renew the lease for a further term at the expiry of the present lease in 1905.

It may be useful here to state my views regarding the working of the Jaunsár deodár forests as a whole, subject, of course, to considerable modification when all the forests have been valued and their resources thoroughly well known. The forests which remain to be valued are Lambatách, Dádi, Raiengarh, Cháchpur, Morách, Koti (Báwar), Kathiáu, Riknár, Bomnai, Majbira, Sangráni, Lokár, Jáko and Hariánta aggregating about 20,000 acres, or one season's work for a Working Plans' officer.

Four working circles will probably be formed as in the following table :—

Working circle.	Forests or blocks comprised in the working circle.	Total area of forest or block.	Deodár producing area (estimated) only	No. of I class deodar over 2' in diameter.	No. of I class exploitable deodár.	No. of II class deodár 1½' to 2' in diameter.	Remarks.
		Acres.	Acres.				
Leased forests and Cháchpur.	Tehri forests ...	45,198	29,660	136,963	46,000	50 000	Leased for 20 years.
	Dádi ...	1,630	1,000	Enumeration not yet made.			" 50 "
	Raiengarh ...	4,552	1,280				" 50 "
	Cháchpur ..	600	400				In Jaunsár, but between Raiengarh and Dádi.
	Total ...	51,980	32,340				
Jaunsár-Báwar export forests.	Mundáli* ...	3,222	2,058	...	8,049	...	*Vide* Mr. Fernandez' working plan.
	Morách* ...	3,662	1,800	Enumeration not yet made.			
	Koti (Báwar)* ..	100	100				
	Kathián* ...	608	608				
	Pání-ka-nál ...	891	445	1,309	250	901	Probable export line *viâ* the Dhara gád.
	Bodiár* ...	1,463	1,333	Enumeration made; figures will soon be available.			These forests form part of the Deoban range and are within a few miles of the Tons. II class forests will also have to supply free grants.
	Motia (part of) ...	150	150				
	Missau ...	1,527	1,100				
	Asmári ...	380	150				
	Kopti (part of) ...	250	250				
	Kanásar* ...	173	173				
	Chátri (part of) ...	100	100				
	Marauwa (part of).	150	150				
	Total ...	12,676	8,417				
Chakrata timber supply.	Karamba ...	2,160	1,500	5,133	2,000	1,862	A few free-grant trees will be required.
	Konain* ...	529	525	2,675	500	1,672	
	Rikta ..	538	520	636	50	367	
	Total ..	3,227	2,545	8,444	2,550	3,901	
Free grants ...	Riknár ..	1,256	628	Enumeration not yet made.			Export to the plains is difficult from most of these forests.
	Bomnai ...	2,457	1,200				
	Majbira ...	1,174	900				
	Sangrani ..	586	195				
	Lokár ...	1,027	500				
	Jako ...	827	275				
	Hariánta ...	1,253	300				
	Deoban range (scattered deodar forest).	1,200	1,200	Enumeration made; figures will soon be available..			Parts of Thona, Kanjátra, Durim, Bájamára, Logunna, Siári, Gutugád and Bhujkoti.
		9,785	5,198				

N.B.—With the exception of the number of deodár given for the Tehri and Mundáli forests, all the above figures are subject to correction.

*First class forests except a part of Mundali.

The Jaunsár-Báwar export forests, with the exception of Mundáli, have all been more or less worked for many years past. Timber from Morách and Koti (Báwar) was exported *viâ* the Tons before the Tehri forests were tapped, whilst the forests near Deoban have contributed to the timber supply required for Chakrata, and for free grants. The latter forests were in a semi-ruined state when taken charge of by the Forest Department, and although they have improved immensely, it will not be possible to work them for export purposes for many years to come.

The Karamba forest has been only slightly indented on by free grantees and contains many very fine trees. It should suffice to supply Chakrata with timber for the next 20 or 30 years, after which Konain and Rikta or Konain alone would probably furnish enough timber, provided the station had not been considerably enlarged in the meantime.

Little is known about the resources of the forests it is proposed to set aside for free grants, but it is probable that they will more than suffice for local requirements, aided as they must be by the other second-class forests, because the villages adjoining such forests must obtain their trees from them.

As regards the leased forests, Raiengarh has been worked out, and it is probable that Dádi, Cháchpur, Dátmir and Lambatách (last worked in 1875), together with portions of forest reserved in paragraph 120 of of this plan, and which may escape being worked during the term of the lease, will supply enough timber for the first period of the rotation. If the valuation surveys to be made show that this will not be the case, then it may be perhaps better to form one working circle for the leased forests and the Jaunsár-Báwar export forests combined, or to add to the former Morách, Koti (Báwar) and Kathián according to the results of the enumeration.

It is clear from this that the deodár forests of the division are being worked very prudently, and that the proper time for working the Mundáli forest cannot well be decided until the remaining deodár areas have been examined and valued.

Exceptional difficulties had to be overcome in the preparation of the present plan. More than half the forests had to be demarcated and rough sketch maps of them prepared ; at the same time that they were divided into blocks and compartments, and a complete enumeration made of their contents in deodár. The compartments had also to be described simultaneously with all this work, whilst the physical obstacles to contend with were of no mean order : the ground being often precipitous, frequently inaccessible, and, as a rule, there were scarcely any foot-tracks.

The descriptions are not therefore very accurate, and are often wanting in detail; but the difficulties met with will, it is hoped, be considered a sufficient excuse for these shortcomings. They were prepared before the views of the Inspector-General of Forests regarding co-efficients were circulated, or such figures would have been omitted.

The following reports, &c., have been of great use in preparing the plan: Suggestions by Sir D. Brandis, 1879 and 1881; Deota sledge road, by Mr. E. McA. Moir; Annual Reports of Forest Administration, North-Western Provinces and Oudh; and Plantation Notes by Forest Students.

Glossary of vernacular words used in the text.

Ayár	*Pieris ovalifolia.*
Bán	*Quercus incana.*
Buráns	*Rhododendron arboreum.*
Chak	A demarcated piece of cultivation within the forest boundary
Chír	*Pinus longifolia.*
Deodár	*Cedrus Deodara.*
Dhár	A ridge.
Gád	A mountain stream.
Inai	*Quercus annulata.*
Kail	*Pinus excelsa.*
Karshu	*Quercus semecarpifolia.*
Khud	A ravine.
Morinda	*Abies Webbiana.*
Moru	*Quercus dilatata.*
Rai	*Abies Smithiana.*
Ringál	*Thamnocalamus spathiflorus.*
Sóom	*Machilus sp.*
Tách	A resting-place in the forest for sheep and cattle.
Tiba	A mountain peak.

TABLE OF CONTENTS.

PARAS.

CHAPTER I.—SITUATION, BOUNDARIES, AREA, AND HISTORY.

Situation and principal divisions 1
Description of the boundaries of (1) Deota forests 2
" (2) Chánsil " 3
" (3) Noránu " 4
" (4) Naintwár " 5
" (5) Dátmir " 6
Length of the outer boundary 7
Two cases of disputed boundary (Dedragád and Lambatách) 8
Cultivation within forest limits 9
Approximate area of the forests 10
Forests leased from His Highness the Réja of Tehri Garhwál 11
The survey of the forests 12

CHAPTER II.—DESCRIPTION OF THE FORESTS.

(1). *Deota.*—Area, boundaries, and blocks 13
" Configuration 14
" Rock and soil 15
" Stock 16
" Reproduction 17
(2). *Bamsu.*—Area, boundaries, and blocks 18
" Configuration 19
" Soil 20
" Stock 21
" Reproduction 22
(3). *Sarás.*—Area, boundaries, and blocks 23
" Configuration 24
" Rock and soil 25
" Stock 26
" Reproduction 27
(4). *Sáhlra.*—Area, boundaries, and blocks... 28
" Configuration 29
" Rock and soil 30
" Stock 31
" Reproduction 32
(5). *Noránu.*—Area and boundaries 33
" Configuration 34
" Rock and soil 35
" Stock 36
" Reproduction 37
(6). *Naintwár.*—Area and boundaries 38
" Configuration 39
" Stock 40
" Reproduction 41
(7). *Dátmir.*—Area and boundaries 42
" Configuration 43
" Stock 44
" Reproduction 45
(9). *Lambatách.*—Area, boundaries, and blocks 46
" Configuration 47
" Rock and soil 48
" Stock 49
" Reproduction 50
(9). *Kotigád.*—Area, boundaries, and blocks 51
" Configuration 52
" Rock and soil 53
" Stock 54
" Reproduction 55
(10). *Chánsil.*—Area, boundaries, and blocks 56
" Configuration 57
" Rock and soil 58
" Stock 59
" Reproduction 60

PARAS.

Summary of the above descriptions 61
The climate 62

CHAPTER III.—PAST MANAGEMENT.

Protective charges 63
Departmental timber operations 64
Sale of standing trees... 65
Number of trees felled under the old lease 66
Details of the fellings made at Deota 67
Success of fire-protection in the past 68
Length of the present fire-lines... 69
Protection from grazing 70
Record of planting operations 71
" in Lambatách 72
" in Deota 73
" in Dátmir 74
Cleaning of young kail over deodár 75
Ringing inferior species 76
Other cultural operations 77
Extraction of deodár oil 78
Extraction of iron 79
Roads and paths made under the old lease 80
The Chakráta—Tons road 81
The Tons river path 82
Miscellaneous roads 83
The seven principal bridges 84
Rest-houses and other buildings 85

CHAPTER IV.—DEMANDS FOR PRODUCE AND LINES OF EXPORT.

Railway sleepers only in demand 86
The requirements of the Rájputána Málwa Railway 87
Decline in the price of sleepers 88
Demand for standing trees 89

EXPORT WORKS.

Lambatách tramway 90
Lambatách slide 91
Number of sleepers exported from Lambatách 92
Deota slide 93
Deota sledge-road 94
Deota dry slide 95
Attempt to put up a wire tramway 96
Floating timber on the Tons 97
The river rules 98
Extent of the timber trade 99
Floating timber by contract and by Government agency compared ... 100
Dákhpatthar boom 101
Catching timber during the floods 102
Scourage of sleepers in transit 103
Floating to Delhi 104
Arrangement with the Sirmur State 105

CHAPTER V.—FORMATION OF RANGES, BLOCKS, AND COMPARTMENTS, AND VALUATION SURVEY.

Tabular list of ranges, blocks, and compartments 106
Formation of blocks 107
Formation of compartments 108
Mode of conducting the valuation survey 109
The contents of the forests in deodar 110

CHAPTER VI.—YIELD OF THE FORESTS.

Rate of growth 111
The size which deodar can attain... 112
The minimum size of trees to be felled 113
The real outturn per tree in past fellings 114
Proportion of utilisable timber in a first class tree 115
Number of first class trees available in forests not yet worked over ... 116

PARAS.

CHAPTER VII.—THE WORKING PLAN.

Plan to be considered as beginning from 1885 117
Trees felled during 1885 and 1886 and marked for felling in 1887 118
Felling operations prescribed until the end of the lease 119
Forests in reserve 120
Protection from fire and grazing 121
Plantation work 122
Cultural operations to be carried out prior to the fellings 123
Cultural operations to be carried out after the fellings... 124
Export works required 125
Dates proposed for the preparation of plans and estimates for such works ... 126
Works required in Deota 127
Ditto Bamsu and Sarás 128
Ditto Sáhlra 129
Ditto Naintwár 130
Ditto Kotigád 131
Ditto Noránu and Dátmir 132
Communications and buildings 133
Boundary of the newly-demarcated forests to be more clearly defined ... 134

CHAPTER VIII.—FINANCIAL RESULTS EXPECTED

Reasons why a rough estimate only can be made 134
Details of anticipated receipts and expenditure 135
Justification for working departmentally 136

APPENDICES.

A.—Lease of the forests.
B.—Description of blocks.
C.—Description of compartments.
D.—Table of contents of blocks.
E.—Table of contents of compartments.
F.—Jumna river rules and regulations.
G.—Notice under the river rules by the Conservator of Forests, School Circle.
H.—Western Jumna Canal rules for the measurement of rafts.
I.—Yield in metre gauge sleepers of sample trees in the Deota forest.

MAPS, &c.

The Working Circle ... ... 1 inch = 1 mile.
*Sheet No. I. Tehri Garhwál Survey ... ... 4 inches = 1 mile.
* „ No. II. Ditto ... ... ditto.
*Tracing No. 1. Sketch map, Chánsil and Sáhlra (part of) ... ditto.
* „ 2. Ditto, Sahlra (remainder of) ... ditto.
* „ 3. Ditto, Noránu ... ... ditto.
* „ 4. Ditto, Naintwár ... ... ditto
* „ 5. Ditto, Dátmir ... ... ditto.
* „ 6. Ditto, proposed export line from Bamsu ... ditto.
Drawing No. 1. The Lambatách tramway.
„ 2. Ditto slide.
„ 3. The Deota sledge road
„ 4. The Dákhpathar boom.

* *These maps are not bound up with the plan.*

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CHAPTER I.

SITUATION, BOUNDARIES, AREA AND HISTORY.

1. These leased forests are all situated in the upper valley of the river Tons and on its right bank with the exception of compartment 1, Dátmir, on the left bank. There are five separately-demarcated areas, and the first three are conterminous, forming perhaps the largest and most compact deodár forest in the world. Their boundaries are—

2. (1)—Deota forests (including Lambatách, Deota, Bamsu, Sarás and the Kotigád forests, except the Gokal block).

On the north a line demarcated by pillars from a point (pillar No. 28) on the Paji dhár above the Bargat gád, passing south of the village lands of Makuri, to a point on the Damiári gád (pillar No. 47); on the east a line from the last-mentioned point passing above the Jajrári, Bamsu and Deota villages to the Bhagiár stream, half a mile above its junction with the Tons; on the south from the last-mentioned point a demarcated line running above the old Kimári and Pokhári villages to a point on the Lohásu dhár (pillar No. 11); on the west from the last-mentioned point a demarcated line skirting the Karoli, Maingani, Bhutár and Dhámti villages to the point on the Paji dhár (pillar No. 28).

3. (2)—The Chánsil forests (including the Chánsil and Sáhlra forests and the Gokal block of the Kotigád forest).

The boundary runs in a generally south-westerly direction from pillar No. 1 just below the Kuamund peak on the main Chánsil ridge down the Galtai gád to its junction with the Dedra gád, then up the latter stream for a short distance to its junction with the Seral gád, which tributary it follows until it finally reaches the Kasla Munda dhár at pillar No. 9, and continues along it southwards to pillar No. 12 above the village of Duchánu. There is then a line of pillars running east to pillar No. 17 above the village of Jágta; the boundary then trends to the north-east above the village of Cheo and meets the Dedra gád at pillar No. 25 just below the Garol gád, whence it proceeds up the former stream for about 30 chains to pillar No. 26. It then leaves the stream and goes north up the hill, being marked by a line of pillars as far as No. 34 when it trends south-east to pillar No. 39, and then again north to pillar No. 41. From this pillar it runs down a dhár meeting the Koti gád at pillar No. 42, close to the Andri gád, it then ascends the former to a few chains above the latter gád at pillar No. 43, where it leaves the stream and runs east up a dhár to pillar No. 46. From this point it descends southwards by a line of pillars to the Batroli gád, and still going south runs up a tributary of this stream to pillar No. 51; still continuing in a southerly direction above the village of Gokal and generally following ridges it meets the Innadi gád at pillar No. 57, and follows this stream for a short distance to pillar No. 58, whence it runs east up the Sándi dhár to pillar No. 59. It then turns south down a small ridge to pillar No. 61, where it meets a small stream, down which it runs westwards to the fire-line of the Kotigád forest, which it touches at pillar No. 62, a few chains above pillar No. 45 of the previously demarcated forest. From this point it takes a south-easterly course along the fire-line past the old pillar No. 46, down to pillar No. 63. Here it leaves the fire-line running east up a small ridge to the Máli dhár at pillar No. 64, whence it continues east by a line of pillars to the Jakar gád at pillar No. 74, and from this point it ascends the stream for a short distance

to pillar No. 75, where the path to Sáhlra village crosses ; it then follows this path towards Sáhlra as far as pillar No. 79, diverging slightly to the south between pillars Nos. 76 and 78. From pillar No. 79 it runs north-east up a dhár to pillar No. 80, and then down a second dhár to the Jodar gád which it meets at pillar No. 81, proceeding down the stream for a short distance to pillar No. 82 just above the Sáhlra path. It now leaves the stream and runs up a ridge to pillar No. 83, and thence along a dhár to the main Chánsil ridge, which it follows back to pillar No. 1.

(3).—*Noránu.*

4. From pillar No. 1 on the ridge forming the watershed line between the Rupin and the Tons, the boundary runs north-east in a straight line between pillars Nos. 2 and 3, at pillar No. 3 it runs down a small stream to pillar No. 4 on a sheep-path, which it follows in an easterly direction to pillar No. 5, and then goes north down Duid dhár to pillar No. 6 at the junction of the Bokára Tára and Bato gáds. From this point it continues north up a dhár to pillar No. 7 whence it runs east along a line of pillars over very precipitous ground to pillar No. 11, and thence it goes north-west to pillar No. 12 on the main ridge before mentioned, along which it returns to pillar No. 1.

(4)—*Naintwár.*

5. From pillar No. 1 on the ridge forming the watershed between the Rupin and the Supin, the boundary line descends the Báli dhár in a southerly direction to pillar No. 2, and then goes west in a straight line to pillar No. 3 on the Kurbagád. From this point it runs north-west up a small stream, which it leaves at pillar No. 4, running up a small dhár to pillar No. 5 ; thence it goes west along a line of pillars over very precipitous ground above the village of Koarbo to pillar No. 12 on a ridge above the Mairigád. Form this point it goes down a small khud to pillar No. 13 on the path to Kourbo at pillar No. 14, and thence goes west down a dhár to the Mairi gád, which it meets at pillar No. 15. From this pillar it runs in a westerly direction up a dhár to pillar No. 16 and continues west in a straight line to pillar No. 17 in a small khud, up which it runs to the above mentioned watershed line, which it follows round to pillar No. 1.

(5)—*Dátmir.*

6. On the north there is a demarcated line from a pillar on the main ridge between the Tons and the Supin to a point above the village of Gungár, whence the boundary runs down the right bank of the river to a pillar about three-quarters of a mile below the Dátmir bridge, and from the last-mentioned spot it runs up the Sundrugád back to the main ridge. There is also a small detached block demarcated by ten pillars on the left bank of the Tons below Dátmir village.

7. The length of the outer boundary is roughly estimated as follows :—

Name of forest.	Number of miles.	
	Artificial.	Natural.
Deota	38	Nil.
Kotigád and Sáhlra	27¾	19
Noránu	4½	4½
Naintwár	6	4½
Dátmir	5	5
Total ...	81	23½

By natural boundary is intended one of the prominent natural features of the country where no pillars are necessary, *e.g.*, in the case of the Kotigád and Sáhlra forests, the main Chánsil ridge has been considered a natural boundary ; in the case of Dátmir, the river Tons and the watershed line between that river and the Supin. The artificial boundary of the Deota forests is well marked by a cut line two feet in width.

The number of boundary pillars around the different forests is—

Deota forests	...	64
Chánsil	...	83
Noránu ...	...	12
Naintwár ...	...	18
Dátmir ...	...	?

These all bear serial numbers, except in the case of Dátmir.

8. In the Dedragád block the boundary follows the line decided by the Deputy Commissioner of Simla in 1882 to be the boundary between the Tehri-Garhwál and Keuntal states, and thus about 3,000 acres at the head of the Dedragád are excluded. In the Lambatách forest there was a difficulty with the villagers of Thanwár who endeavoured to cultivate within forest limits, which has been settled by a readjustment of boundary.

9. With the exception of one or two fields near the Lambatách hut, cultivation is only found in the Dedragád block, and here five chaks have been formed for the benefit of the Cheo villagers, *viz.*:—

Number of chak.	Number of pillars.	Area of chaks, in acres.	Compartment in which situated.
I	16	95	Dedragád 10
II	4	8	Ditto 10
III	3	3	Ditto 10
IV	4	6	Ditto 4
V	5	11	Ditto 1
Total ...	32	123	

10. The area of the working circle can only be given approximately, as accurate maps are only available for the Deota forests; it is estimated thus:—

			Acres.	
1 Deota forests ...	Lambatách		2,883	
	Deota		4,937	
	Bamsu		2,323	
	Sarás		1,234	
	Kotigád (pt. of)		1,108	
				12,465
2 Chánsil forests	Chánsil		11,805	
	Kotigád (pt. of)		3,968	
3 Sáhlra			9,410	
				25,183
4 Noranu				1,520
5 Naintwár				3,450
6 Dátmir (as per annual report)				2 560
		Total ...		45,198

These areas will have to be corrected as soon as the survey of the recently demarcated forests has been carried out.

11. *History.* On the 1st of May, 1864, all forests in Tehri-Garhwál were leased by His Highness the Rája for a term of 20 years to the British Government, who acquired the right with the approval of His Highness to demarcate and strictly conserve any of the deodár forests in the state. This comprised deodár tracts in the valleys of the Ganges, Jumna and Tons, the two latter being included in the Jaunsár Division, which paid for them a rental of Rs. 4,500 per annum. The lease expired on the 31st of April, 1884, but was allowed by mutual agreement between His Highness the Rája and the Government to run on till the end of April, 1885. Rules for these forests, with the Rája's consent, were issued in 1880, and the forests of Lambatách, Deota, Bamsu, Sarás and Kotigád in the Tons valley and the forests of Shikáru, Banál, Shálna, Deoráni and Jaunpur (five small areas) in the Jumna valley were demarcated and protected from fire. In 1879-80 the leased forests of Tehri-Garhwál and of Bashahr, in the valley of the Tons, Rupin and Pábar, together with the Khunigád and Deogarh forests of Jaunsár Báwar, were formed into a separate division called the Tons Division, but the two divisions were reunited as the Jaunsár Division in 1884. The terms of a new lease for 20 years from 1st April, 1885 (*vide* Appendix A) have been agreed to by the Rája, and the annual rental to be paid by the

Jaunsár Division has been fixed at Rs. 9,000. The Rája is, however, unwilling to lease for the same period about 580 acres of chír forest below Bamsu, required for the purpose of making a slide to the Tons for the export of deodár from the leased forests, but is prepared to grant any chír timber that Government may require for the purpose, without charge.

12. The Lambatách, Deota, Bamsu, Sarás and Kotigád forests were surveyed in 1880-82 on the scale of 4″ = 1 mile by the Forest Survey Branch, and two admirable sheets are now available, in which every detail is most faithfully depicted. For the remaining forests, which were demarcated in 1885, there are only rough sketch maps prepared by myself; but their survey by the Forest Survey Branch has been ordered by the Government of India.

CHAPTER II.

Description of the Forests.

(1) *Deota.*

13. *Area, boundaries, and blocks.*—The total area of the forest is 4,937 acres. The outer boundary runs from the Kimári village to the Deotá ridge, and is defined by a two-foot path. The forest has been divided into ten blocks, bounded by natural features and permanent paths, and these are described in Appendix B.

14. *Configuration.*—The upper part of Deota may be regarded as consisting of four bays :—

1st—That including the Kimári block between the Kimári and Patángni dhárs, and drained by the Chabaigád;

2nd—Patángni, between the Patángni and Kánga dhárs, drained by the Kángagád.

3rd—Kánga and Jaurási between the ridges so named, and drained by the Misingád.

4th—The Temple bay, round the head-waters of the Bagiár stream, and consisting of the remaining area between the Jaurási and Palia dhárs, and comprising the Katatach, Dopta, Temple and Pártil blocks.

At their lower end, the four bays are rocky and precipitous and are here narrowed into steep rocky gorges and ravines, thus dividing the Deota forest into two clearly-defined portions, the upper part, described above, with deodár as the chief tree, and the lower blocks, stocked with chír, called Bagiár and Tadiár, and situated on the right and left banks of the Bagiár stream.

Slopes with an easy gradient below 30° are chiefly found in the central part of the Pártil and Temple blocks, whilst on the west bank of the Bagiár nadi there are only small areas with easy slopes, the largest in extent being found in the lower parts of the Kánga, Patángni, and Kimári blocks. Elsewhere the ground is usually steep or precipitous with very short easier slopes between the lines of steeper ground, which usually run east and west. The Dopta block, the upper part of the Katatách and Jaurási, the Bagiár block and the lower part of the Kimári block, are especially precipitous and in many places are unworkable. The highest points in the forest are Lambatách peak, 10,469, and Rikshiss, 10,355 feet. The lowest point, the mouth of the Bagiárgád at its junction with the Tons, is about 3,400 feet. The general aspect of the forest is southerly, but it varies extremely, for each block is divided by ravines and gullies, the opposite sides of which have different aspects. The southerly and south-easterly aspects are usually the most rugged and precipitous, whilst the ground facing north, which does not cover a large area, has generally moderate or even gentle slopes.

15. *Rock and soil.*—The rock is chiefly gneiss or mica-schist, with occasional blocks of quartzite, and is often exposed on precipitous ground. The soil is superficial or absent on the steeper slopes, but elsewhere it is, as a rule, a light sandy loam,

with a good layer of vegetable mould over most of the upper forests. In most of the Pártil and Temple blocks there is a deep sub-soil of red clay, a similar sub-soil also occurring in parts of the Kánga, Patángni and Tadiár blocks.

16. *The stock.*—Below the Lambatách and Dopta ridges there is a belt, chiefly stocked with karshu, stunted deodár, and a little morinda and rai; karshu being the prevailing tree. This description of forest growth covers a considerable area in Dopta, Jaurási, and Kánga. The ground below the karshu belt and above the line of precipices is chiefly stocked with deodar, pure on the more precipitous parts as Dopta, Katatách 5, Jaurási 4 and 5, and higher part of Patángni; elsewhere associated with some spruce and silver fir, which predominate on the more gentle slopes of the Pártil and Temple blocks, and on the slopes with a northerly aspect in Kánga, Patángni, and Jaurási. The moru oak is an important associate of deodár over a considerable portion of the forest, and it is most common on gentle slopes with deep soil. On the west side of the Bagiár nadi there are some slopes with northerly and north-easterly aspects: for example Patángni 3 and 4 with a large proportion of this oak; moru is also abundant east of the Bagiár, in the lower parts of the Temple, and the central and upper parts of the Pártil block.

Bán oak is common in the lower part of the deodár zone near the line of precipices, the forest being usually rather open and containing a mixture in variable proportions of deodár, kail, bán, buráns, ayár, and occasional rai; the oak frequently predominating as in Pártil 1 and 5 (upper part) and Pártil 2 (lower portion), in the lower part of Temple 5 and below the Kimári road in the Kánga block; whilst the upper part of the Kimári block (compartments 1 and 2) mainly consists of the same oak. This oak is to be met with at high elevations on warm southerly aspects, so that on the cold side of a given stream moru may abound, whilst at the same elevation on the other side there may be nothing but bán. This oak, together with buráns and ayár, runs also into the upper part of the chír zone, but is there most abundant in shady ravines.

A few walnut, maple, and horse chestnut are found associated with deodár near streams, and the birch is not uncommon. Blank slopes without any forest growth in the deodár portion, are only found in the vicinity of the Deota ridge, in the lower part of the Pártil block, and on precipitous slopes with a southern aspect elsewhere. Of the undergrowth little need be said; ringál is found where the soil is deep and moist, and indigofera and desmodium are found on many of the blanks.

Chír forms the forest in the lower part of all the blocks, up to the upper edge of the line of precipices, generally extending up to 7,000 feet, and the entire stock in the Bagiár and Tadiár blocks is composed of this species, which also predominates in Pártil 3 and the lower part of Pártil 1, in Katatách 1, Jaurási 1, Patángni 1 and 5, and in Kimári 3.

Taking Deota forest as a whole, the following zones may be distinguished and the areas under each roughly estimated as follows:—

	Acres.
1st, the Chír zone	1,927
2nd, the Deodár zone	2,450
3rd, the Karshu zone	550
Total	4,927

Thus, the deodár-producing area is about half the total area of the forest. Over this area every variation in density is to be met with, from the open grassy blanks of the Pártil blocks and of other places mentioned above, to the dense mixed deodár and fir forest covering a great part of the Temple block and the northerly slopes of Kánga and Patángni. The quality of the deodár also varies greatly, the trees being badly grown and very branchy on precipitous and exposed slopes and in other open parts of the forest, whilst they are often stunted towards the main ridge. On the steep and precipitous ground in Dopta and in the upper parts of Dopta, Katatách, Jaurási, Kánga and Patángni at an elevation of from 8,000 to 10,000 feet, the trees

are neither tall nor of large girth ; the rate of growth must also be much lower than in the more favored localities, and probably many of the second class trees are of great age. Elsewhere, however, the quality is often very high ; in the Pártil and Temple blocks and in Katatách 4, the second class deodár are in many places remarkably fine, their stems being tall, straight, and unbranched to a considerable height. In the blocks which have not yet been worked out, Kanga and Patángni, there are also very fine trees on the less precipitous portions, some of the large deodár mixed with the moru and ban in Patángni 3 and 4, being really magnificent, but the average girth is less throughout these blocks than in Pártil and Temple.

17. *Reproduction.*—In the deodár zone, reproduction is as a rule good, save where the cover is too dense, deodár and kail seedlings being plentiful as well as rai and moru where these species are found ; many of the open grassy slopes are getting rapidly filled up with kail seedlings and where there are seed-bearers with deodár as well, but seedlings are scarcer and sometimes absent in the indigofera scrub. In some of the oak forest especially amongst the tán, buráns, and ayár, there is often magnificent reproduction of deodár and kail ; as, for example, in the Patángni block. The blocks which have been worked over deserve special notice In Pártil, where the earliest cuttings were made, the natural reproduction of deodár is, on the whole, exceedingly satisfactory, there being a good deal of advanced growth and a large number of seedlings from the prolific seed-years of 1878 and 1881. The only places not stocked naturally in a satisfactory manner are the moist ravines coming down from Leesitách and a number of grassy slopes with a south-westerly aspect. In the Temple block cuttings were made at a later date than in Pártil, and although there is a large quantity of advanced growth, the number of seedlings is much less than in the latter block.

In the Katatách block, which was worked over in 1881-83, reproduction is good for kail, deodár and chír wherever the cover is not too great. The lower road, which was used for export purposes, is now completely choked with kail and deodár seedlings.

(2) *Bamsu.*

18. *Area, boundaries, and blocks.*—This forest has an area of 2,323 acres, its outer boundary extending from pillar No. 52 on the Birga dhár to pillar No. 62 at the head of the Kasmalta dhár. It has been divided into three blocks, Pipal, Dhikuri, and Bamsu.

19. *Configuration.*—The forest includes the entire basin of the Bamsu gád comprised within forest limits and of a small area, compartment 3 Bamsu, which drains directly into the Tons. Rocky and precipitous ground prevails, but moderate slopes (scarcely ever under 30° however) are common in the Bamsu block and in the Pipal block near the ridges and throughout compartment 4. The main aspects are north-east and south-west, the gád running in a south-easterly direction. The altitude varies from 10,421 feet on the main ridge to about 5,700 feet at pillar No. 58, where the gád leaves the forest.

20. *Soil.*—The soil is a light loam, shallow or absent on the ridges, but deep in ravines, and there is often a good layer of humus, save in the Bamsu block.

21. *The stock.*—Along the main ridge karshu predominates, with some rai and moru and a few scattered deodár, but throughout the greater part of the Pipal and Dhikuri blocks there is a dense forest of deodár, rai, and morinda and some kail in the lower parts, the firs not unfrequently predominating to the detriment of the deodár. The latter species is especially abundant on ridges and other places where it can get sufficient light, fine, tall, straight trees being numerous. There are one or two cypress in rocky places and a few broad-leaved species such as moru near the gád, whilst along the bed of the stream are to be found birch, horse-chestnut and a few walnut. In Pipal 4 grassy slopes are common with scattered deodár and kail and a few small ban, &c. In the Bamsu block the stock is very variable, in some places there

being a pure deodár forest or deodár mixed with kail, ban or moru ; in other parts a very open mixed forest of the same species with extensive grassy slopes, those facing south being usually the barest. Chír acompanied with ban, &c., is to be found in the lowest parts. The different types of forest are thus represented:—

	Acres.
Chír	103
Deodár	1,900
Karshu	320
Total ...	2,323

22. *Reproduction.*—In the mixed deodár and fir forest reproduction is slight, owing to the dense cover; what exists being mainly morinda with a little deodár on ridges. On grassy slopes and in other open places it is usually good, especially for kail, whilst deodár seedlings are also pretty abundant, and even some of the most exposed southerly slopes are gradually being filled up. Reproduction is, however, slight in Bamsu 3 and only fair in the lower parts of that block.

(3) *Sarás.*

23. *Area, boundaries, and blocks*—The area of the forest is 1,234 acres, which includes a portion, 220 acres in extent, recently demarcated to the north of the Sarás fire-line, and which forms compartment No. 5, Damráli. The outer boundary of the forest follows a ridge from the Birga dhár to a cut fire-line, and then this line to the new pillar No. 63, whence it follows a line of pillars as far as No. 67, where it meets the Sáhlra forest. Two blocks have been formed, *viz.*, Kánda and Damráli.

24. *Configuration*—The forest includes all that portion of the basin of the Damráli gád included within forest limits, and in addition a small area to the north forming a part of Damráli 5. With the exception of Damráli 3 and 5 the whole forest is on the southern bank of the gád. The slopes are usually moderate or rather steep and broken by lines of precipitous ground, but precipitous broken ground is common above ravines and over the greater part of Damráli 5 and Kánda 1. The aspect is generally north-easterly, but in Damráli 3 and 5 it is southerly. The altitude alternates from 10,421 feet on the main ridge to 6,949 feet at the place where the fire-line crosses the Damrári gád.

25. *Rock and soil.*—A superficial loam with underlying clays, slate and mica schist prevails in the lower parts ; higher up on the portions facing north and east there is a deep moist loam on the less precipitous parts, whilst in Damráli 3 and most of Damráli 5 facing south the soil is superficial and sandy with quartzite rock often showing.

26. *The stock.*—In the upper part on northerly and easterly slopes there is a dense forest of rai, morinda and deodár, the two former species predominating almost throughout, and being the only trees except karshu in the belt of forest along the main ridge. Deodár is most abundant on the precipitous ground and along ridges. Lower down there is a mixture of rai, deodár and some kail, with a few broad-leaved species, bán, moru, buráns, ayár, &c , the forest being very open in parts, with grassy slopes, especially in Kanda 1. The deodár are similar in quality to those in the Bamsu forest.

The different forest types are represented as follows :—

	Acres.
Chír	*Nil.*
Deodár	1,000
Karshu	234
Total ...	1,234

27. *Reproduction.*—In the upper parts this is usually deficient, owing to the dense cover, but on the open slopes of the lower portion there are numerous kail seedlings, with a few deodár ; but reproduction is scanty in Kánda 1.

(4) *Sáhlra.*

28. *Area, boundaries, and blocks.*—This forest, which has an area of 9,410 acres, is situated to the west of the Sarás forest, its outer boundary being a line of pillars

from pillar No 67 to pillar No. 83, whilst elsewhere the Chánsil ridge and two main ridges running from it form a natural boundary.

It has been divided into seven blocks, *viz.*, Moriru, Kángagád, Deotálgád, Kunigád, Dwántigád, Siligád and Jodárgád.

29. *Configuration.*—The whole area forms the upper basin of the Kunigád. The valley of this gad as one ascends from the Tons is somewhat narrow, and there are no important tributaries; but about a distance of six miles from the mouth of the stream it begins to spread out like a fan, the gád giving off one important tributary after another, and these again subdividing. From below, at the point where this begins, the upper basin has the appearance of a large semi-circular bay bounded along the main ridge by, in many places, enormous and almost perpendicular masses of rock, the rich deodár forests being concealed in the valleys of the various tributaries, the principal being those which have given their names to the blocks enumerated above. The basin of those tributaries at their lower ends are narrowed into deep, rocky, precipitous gorges, giving rise to some very fine waterfalls, as, for example, one just below the camping-ground and another not far from the mouth of the Jodárgád. This peculiarity helps to separate very distinctly the upper from the lower basin of the main gád even in a more marked manner than in the Deota forest, and, like it, the one is stocked with deodár and karshu, the other with chír. It is this line of precipices therefore, which mainly forms the outer boundary of the forest. The whole of the forest faces south, with a succession of slopes on the right and left banks of the various gáds, having, as a rule, north easterly or easterly and south-westerly or westerly aspects, respectively. This alternation of aspect exercises a most marked influence on the configuration of the ground, the exposed slopes being usually very precipitous and rocky and not unfrequently inaccessible, whilst on the others the gradient is generally moderate or steepish, not often exceeding 35°.

30. *Rock and soil.*—The soil is fairly uniform according to aspect and gradient; on northerly slopes consisting of an excellent loam of a fair depth, with a good layer of humus, whilst on southerly ones it is either superficial or absent. In the upper part the rock is gneiss, in the lower part slate and quartzite, the latter being common along the line of precipices, as it is in the Deota forest; and this geological feature may be the cause of the sudden charge in gradient.

31. *Stock.*—The stock in this forest exemplifies in an admirable manner the effect of aspect and altitude on forest vegetation in these regions; thus along the main ridge there is the usual belt of karshu, rai, and morinda, whilst in the central part of the forest, beginning from the south-west, we find a succession of ravines and streams, including the Kánga and Isteri gáds, having a course almost due east, so that all the slopes on their right banks face due north, and it is on these slopes, which have a moderate gradient, that we find dense forests of rai, morinda, moru, &c., with usually only a few scattered deodár, chiefly on ridges; whilst on the opposite and precipitous slopes facing due south, we meet with either a pure deodár forest or this species mixed with kail, or occasionally with a few rai; many of the slopes being, however, too precipitous for working purposes. Then come the Deotál and Kunigáds running in a south-easterly direction, so that the slopes on either bank have, respectively, north-easterly and south-westerly aspects; on the former slopes we no longer find the dense fir forests characteristic of the Kángagád, but a mixed forest of deodár, rai, and moru, and in the lower parts either kail and deodár or ban and oak, with large well-grown deodár, rai, and kail; on the south-westerly slopes the deodár is almost pure, but there are only a few workable places. Next we come to the Dwánti, Sili and Jodár gáds, all running almost due south, and consequently, with the compartments formed out of their basins, facing due east and west; in compartments with an easterly aspect in the Dwanti and Siligáds there is, for the most part, a splendid deodár forest with a few rai, moru, and kail, bán and kail predominating in the lower parts with scattered deodár, whilst on similar slopes of the Jodárgád there is a pure deodár forest above, with open grassy slopes containing scattered deodar and kail lower down. On the westerly slopes there

is almost a pure deodár forest and the ground is mostly workable, but in the Jodár gád block moru oak is common at this aspect and occasionally predominates, although there is always a considerable proportion of deodár. Thus as the aspect veers round from due north to due east, so does the stock change gradually from a pure fir to a pure deodár forest; which latter type is almost always found on parts facing the west and the south, but is here often unworkable owing to the precipitous character of the ground. There is often a fair proportion of moru in the denser forest, and ban oak associated with kail and an occasional deodár, occupies a considerable area in the lower portions of the forest, as for example in Moriru 3 and 4 and in Kunigád 1; such forests are admirably suited for the growth of deodár. Broad-leaved trees are usually numerous at the bottom of the valleys, especially the moru oak and also soom in the Kánga and Deotal gads, whilst some box is found in the valley of the former stream. On northerly and north-easterly slopes the ground is well covered with numerous undershrubs and ringáls are plentiful. There are a large number of fine, tall, well-grown deodár throughout the forest, the Dwánti, Sili and Jodárgáds being the three richest blocks. Trees of the IV. class are most numerous in Kángagád where there are some dense young pole forests in places. The forest is practically a virgin one and there are no less than 2,325 fallen large and sound trees, whilst there are 1,675 dry trees still standing. The chír is all outside the boundary, so the stock may be divided thus:—

	Acres.
Deodár zone	7,500
Karshu and fir	1,910
Total ...	9,410

32. *Reproduction.*—Fires due to graziers appear to be frequent in the lower parts, especially where there is kail, and hence seedlings are scarce, but protection should remedy this unsatisfactory state of affairs in a very few years; elsewhere reproduction is satisfactory, but of course there are few or no seedlings in the denser parts of the forest, the cover not admitting of any reproduction.

(5) *Nordnu.*

33. *Area and boundaries.*—This forest, with an area of 1,520 acres, is conterminous with the Sáhlra forest on the west, where the watershed line of the Rupin forms the boundary, which elsewhere is marked by a line of pillars. It has been divided into five compartments.

34. *Configuration.*—The forest is formed of the upper basin of the Kanoni gád, which runs in a south-easterly direction into the Rupin, meeting that river about three miles from where it leaves the forest boundary. There is a great deal of most precipitous ground which will render the forest very difficult to work, especially as there is a line of precipices all along the outer forest boundary from pillar 6 to pillar 12. Compartment 1 on the south side of the gád consists almost entirely of moderate even slopes. Between this forest and that of Sáhlra and above the village of that name, is the finest cliff I have ever seen, consisting of a sheer wall of rock from the highest peak where the karshu oak grows, to the bottom of the valley containing chir, which represents a drop of several thousand feet. In the middle of this cliff there is a ledge with some deodar growing on it, accessible only in a balloon. The usual aspects are south-westerly and south-easterly, but compartment 1 faces the east.

35. *Rock and soil.*—As in Chánsil.

Stock.—On the moderate slopes facing the east there is a dense forest of rai and morinda, with deodár and kail on the main ridge and on some of the more prominent spurs, broad-leaved species being represented by moru in the lower and karshu in the upper portion. In the compartments facing south, deodar predominates with a belt of karshu along the main ridge, the richest compartment being No. 3.

The area of the deodár and karshu zones is estimated thus:—

	Acres.
Deodár	1,020
Karshu	500
	1,520

36. *Reproduction.*—Owing to the precipitous character of the ground and the absence of all inspection paths, this could not be properly examined.

(6) *Naintwâr.*

37. *Area and boundaries.*—The area has been estimated at 3,450 acres. The forest is situated about two miles directly above the Tons and to the south-east of the water-shed line of the Rupin which forms its upper boundary, whilst its lower boundary is defined by a line of pillars. It has been divided into seven compartments.

38. *Configuration.*—The ground is very rocky and precipitous immediately above the village of Koarbo, whilst on either side are the basins of the Mairi and Karba gáds, with large areas of moderate slopes. The aspect of the precipitous portion is due south, whilst elsewhere the slopes face south-east, south-west, west and north-east.

39. *Stock.*—There is a belt of karshu and fir forest along the main ridge, whilst elsewhere there is usually a very fair mixed forest of deodár, kail, rai and morinda, the kail being common towards the outer forest boundary, the rai and morinda in the central and higher parts. The two latter species predominate in compartment 2, facing the north-east, where deodár only occurs on the ridges and on the more precipitous slopes, and a similar forest is found near the gád in compartment 1. On the rocky precipitous ground in compartment 3, there is an open forest of deodár, kail and a few rai, with a little moru and burans. A sprinkling of moru is found throughout the forest, being commonest near streams, whilst in the lowest parts there is also some ban. The best part of the forest is undoubtedly the basin of the Mairi gád; there are also a large number of deodár in compartment 3, but many are badly grown, branchy and somewhat stunted trees.

The areas of the two types of forest are :—

	Acres.
Deodár	2,450
Karshu	1,000
	3,450

40. *Reproduction.*—This is usually fair, especially where kail is common and in such forests fire protection will probably produce a thick crop of seedlings wherever the cover permits.

(7) *Dátmir.*

41. *Area and boundaries.*—This forest, with an area of 2,560 acres, is situated near the head of the Tons mainly on the right bank of the river, compartment 1, however, being on the left bank immediately below the village of Dátmir. It is bounded on the north by the main ridge between the Supin and the Tons and elsewhere by a line of pillars. It has been divided into six compartments.

42. *Configuration.*—It contains the basins of several small streams runing directly into the Tons. On the right bank of the river, *i.e.*, over the greater part of the forest, the ground is almost invariably rocky and precipitous, the slopes being seldom under 40° except in the belt of oak forest above. In compartment 1, which is on the left bank, the slopes are moderate with precipitous ground in one or two places only.

The forest faces the south, with the exception of compartment 1, which has a northerly aspect.

43. *Stock.*—On the right bank there is an open mixed forest of deodár and kail with a few rai and moru in the lower part, whilst higher up rai and morinda become common, and there is a belt of karshu oak along the main ridge. Most of the old deodár are branchy and badly-grown, many of the finest trees having been worked out in 1867-74. Owing to the precipitous nature of the ground, the dry slippery grass in December and the almost complete absence of all foot-tracks, the forest could not be examined in detail. On the left bank there is a dense forest of moru, bán, horse-chest-

nut and rai, a few morinda, fewer deodar and numerous ban which are very knotty and badly grown. The types are represented thus :—

						Acres.
Deodar	...	..	...	...	...	1,430
Karshu	...	..	...	...	...	700
Box	...	...	...	...	...	430
				Total	...	2,560

(8) *Lambatách.*

45. *Area, boundaries and blocks.*—The total area of the forest is 2,883 acres. The outer boundary which runs from Lambatách peak round to Kimári village, is defined by a two-foot path, the eastern boundary being formed by the Lambatách ridge which separates the Lambatách and Deota forests. Kandár is a small detached block south-west of Karoli village. The rectification of the boundary near Thanwára village has now been completed.

The forest has been divided into ten blocks, separated by natural features and permanent paths which are described in appendix B.

46. *Configuration.*—Lambatách may be generally described as consisting of one large bay, which occupies the centre of the forest, being bounded on the north by the Ghoria and Jogi ridges, and on the south by the Chakora and Samani ridges; and of three smaller bays, *viz*, Thanwára on the north, and Lohásu and Inadi on the south. The central bay is drained by numerous feeders, which join and form the Butáru gád. As a rule, the slopes on the right bank have a southerly and those on the left bank a northerly aspect; and a similar variety in the aspect of the slopes is observable in the smaller bays. Throughout the forest, rocky precipices and steep slopes alternate in a very irregular manner with slopes of a more easy gradient, but moderate slopes are commoner than in the Deota forest, and form the greater part of the area in the Chakora, Garasna, Banárpáni, and Thanwára blocks facing west, whilst Inadi, Nainitách and Ghoria facing south and south-west are rocky and precipitous. The highest point is Lambatách peak, which has an elevation of 10,538 feet; the lowest block, Kandár, is about 6,800 feet above sea level.

47. *Rock and soil.*—The rock is principally shale and clay slate, but gneiss is found on the Lambatách peak. The soil is rich, and in many parts consists of a deep loam, with an abundance of vegetable mould in the valleys and ravines and on the better stocked slopes

48. *The stock.*—Along the Lambatách ridge there is a narrow belt of karshu oak which is of greatest width and nearly pure below the Lambatách peak. Lower down along the ridge it gradually narrows and becomes mixed with morinda and deodár. Below this belt of karshu, and extending downwards along the valleys and ravines, the forest is deodár, mixed with rai and morinda, and a few kail. At high elevations on westerly aspects where the slopes are moderate, as in Banárpáni and part of Chakora, there was a dense forest of rai and morinda with a proportion of I and II class deodár everywhere up to the ridge, but this has been opened out by the ringing of a very considerable number of the firs, with a view to encourage the reproduction of deodar. On slopes with a southerly aspect, especially the more precipitous and rocky ones, there is either a pure deodár forest, as in the upper parts of the Inadi, Ghoria and Lohásu blocks, or extensive grassy blanks, which is the condition of nearly the whole of Dhámti, such blanks occurring indeed in all the blocks save Banárpáni; elsewhere in the centre of the forest there is usually an open mixed forest of deodár, kail and moru or bán, the deodár consisting only of some old scattered trees, indeed III and IV class trees are usually rare, being only numerous in the Nainitách and Ghoria blocks. This scarcity of the younger classes shows that the forest must have been steadily deteriorating for a great number of years before its total destruction was checked by the Forest Department. The oaks, moru and bán, are mainly found in the Garásna block. In the lowest parts of the forest with westerly aspect in the Thanwára, Lohásu, Chakora blocks and also in the Kandár block deodár is mixed with a considerable number of kail. The I class deodár having grown up in an open forest, especially on the more

unfavorable aspects, are branchy and badly grown, but most of the best trees were cut out when the forest was worked in 1871-75. Chír is found in the lower parts of the Garásna and Dhámti blocks. The undergrowth consists of ringál, indigofera and desmodium, and is most dense on damp northerly slopes, where it is mixed with balsams and other large herbs. Making an estimation as before, the acreage under different kinds of forest may be stated thus :—

		Acres.
Chír zone	... ...	50
Deodar (including 700 acres of blanks)	... ...	2,500
Karshu	... ...	333
	Total ...	2,883

49. *Reproduction.*—As the whole of this forest has been worked out, it is important to note its present condition as regards reproduction. Writing in 1878, Mr. Greig says—" There are few more enjoyable sights than the open slopes of Lambatách, formerly seas of grass or clearly nibbled or burnt hill-sides, now evenly covered with deodár and kail seedlings ; it was certainly most gratifying to observe the immense improvement our treatment of them has effected ; and not only on grassy slopes, but throughout the forests." Mr. Greig must have been referring particularly to most of the slopes with a westerly aspect.

The present condition may be stated thus. In the upper parts of the forest the reproduction is usually fair, there being generally a number of deodár seedlings, distributed throughout the different blocks but most abundant on the ridges. In Banárpani and Garásna where the girdling operations have been carried out, the soil has as a result, become completely stocked with a dense growth of soft wooded species, such as willows, viburnums, honeysuckles, maples, &c., but advance growth of deodár is seen springing up here and there amidst this tangled mass. On exposed slopes reproduction is unsatisfactory, and only a very few seedlings of kail and deodár can be found in the Inádi and Dhámti blocks, or on the exposed grassy slopes in the Nainitách and Ghoria blocks. In other places covered with brushwood consisting of indigofera and desmodium there are also very few seedlings, which may be due to the heavy and low cover of these shrubs during and after the rains. In parts at a moderate elevation down to the outer boundary of the forest on slopes with a westerly or north-westerly aspect, as in Lohásu, Chakora, Garásna and Thanwára, there is magnificent advanced growth of kail forming dense thickets, with young deodár doing the same near its seed-bearers, whilst almost everywhere some are to be found coming up amongst the kail, but near the Lodigár dhar in the Lohásu block, the reproduction is almost entirely of kail. These young kail are generally from 6 to 17 years old, having all sprung up since the forests were protected from fire and they are from 10 to 30 feet high. The annual shoots of this tree are very long, in some places exceeding two feet, in fact some were measured with a length of three feet.

Kotigád.

50. *Area, boundaries and blocks.*—The area of the forest is 5,076 acres, which is inclusive of the newly-demarcated Gokal block of 1,108 acres. The outer boundary runs from pillar No. 55 in the Gokal block to the made fire-line at pillar No. 62, and then west along this fire-line as far as the Thanwára block of the Lambatách forest. It has been divided into four blocks, Bálcha, Muráli, Ola and Gokal.

A small camping ground has also been marked off with four pillars near Gokal village, and this includes a field three chains by one chain belonging to Gopi Chand of Jaituri, to whom compensation will have to be paid.

51. *Configuration.*—The forest is formed of slopes on the left bank of the Kotigád from the Lambatách forest to the Bannáli gád, and of all that portion of the basin of the Bannali gád comprised within the forest boundary.

Amongst the minor basins the most important are those of the Maoldi gád, the two Muráli gáds, the Raitu gád and the Inádi gád, all these streams running in a north-westerly direction save the Inádi gád which flows towards the south west. With

the exception of the Gokal block which faces south with minor north-westerly and south-easterly aspects, the forest faces north by west with minor easterly and westerly aspects on the right and left banks of the various tributaries of the Bannáli and Koti gáds. There is a very large extent of moderate even slopes in this forest varying from 25° to 35°, such slopes being almost invariably found on the left banks of the various tributaries with easterly aspect, except that the ground is precipitous immediately above the stream. Precipitous and rocky ground is, however, common on their right banks and there is a considerable area of this character in the upper part of the Gokal block. The highest point is Lambatách peak 10,538 feet, the lowest is 6,814 feet on the fire-line at pillar No. 34.

52. *Rock and soil.*—On moderate slopes there is a fairly deep moist loam with good leaf mould in parts and often with a large percentage of clay The soil is superficial on the steeper portions, with frequent out crops of rock, which is usually gneiss, clay-slate or quartzite.

53. *The stock.*—Along the main ridge there is a dense forest of rai, morinda and karshu, including Gokal 4, nearly the whole of Bálcha, Muráli 6 and Ola 7; lower down on favorable aspects there is a mixture of rai, morinda, deodar and kail, the two former being abundant at the higher elevations, the kail at the lower, but deodar very seldom predominates On the steeper slopes in the Gokal block deodar predominates mixed with a few rai and kail and in the lower parts with bán, whilst grassy slopes are not uncommon. Elsewhere on westerly slopes there is either an open forest of scattered deodar, with some rai, kail and bán, or bán with a few kail only, or simply ferns or grass. Immediately above the fire-line in Muráli 5 and in Ola 5 and 6, there are extensive open grassy fern clad moderately even slopes facing north and north-west, containing some old and scattered kail, besides one or two deodar, rai and moru.

The deodár growing as it does on the more precipitous and open parts of the forest is usually rather branchy and not well grown, but there are some very fine trees in places, especially in Bálcha and in Gokal 2, where one or two trees were measured with a girth of 25 feet.

The different types of forest are thus represented :—

	Acres.
Chír	Nil.
Deodár	3,300
Karshu	1,776
	5,076

54. *Reproduction.*—There are very few seedlings in the upper fir forests owing to the dense cover; in the mixed deodár and fir forest the open patches are being filled up with rai and kail seedlings, but reproduction is unsatisfactory in Ola 1, 2 and 3, and is often *nil* in those parts of the Gokal forest which seems to have suffered most from fires. On the open fern clad slopes mentioned above, the reproduction of kail is often excellent and numerous seedlings a few years old are just pushing their heads up through the fern, but owing to the lack of seed-bearers there are scarcely any young deodár save in the immediate vicinity of the few large trees of that species.

Chansil.

55. *Area, boundaries and blocks.*—The area of the forest is estimated at 11,805 acres, but the only map available is a rough sketch map prepared by myself. The outer boundary runs from No. 1 along the boundary of the Keuntal State to pillar No. 12, thence by a line of pillars to the Kotigád forest, the upper boundary being the Chánsil ridge. It has been sub-divided into seven blocks, *viz.*, Duchanu, Jágta, Dedragád, Andrigád, Boktáragád, Tára Mundal and Maunda.

56. *Configuration.*—Chánsil comprises the whole of the forests in the upper basin of the Koti gád, *i e.*, beyond its junction with the Bannáli gád. In this area are included the basin of three large tributaries all falling into the main stream from the north-west; they are the Dedra gád, Andri gád and Boktára gád; in addition there are the basins of numerous smaller streams principally on the left bank, the only

one of any moment on the right bank being that of the stream which passes by the village of Jágta. The greater part of the area consists of rocky and precipitous ground, this character prevailing throughout the Duchánu and Jágta blocks, on slopes facing the south-east on the right bank of the Dedra gád, also over the greater portion of the Andrigád and Boktáragád blocks, the whole of the upper portion of the Tára Mundal block and minor slopes facing the south in that block and in Maunda. Some of the precipices are very grand, and on the right bank of the Kotigád, above the Boktára gád, for nearly two miles there is a sheer wall of rock rising to a great height with no foothold even for a bear.

Moderate slopes on the contrary form most of the Dedragád block, including all slopes with westerly and north-westerly aspects, are common in Andrigád 2 and Boktáragád 2, on northerly slopes in the lower part of the Tara Mundal block and throughout nearly the whole of the Maunda block.

The altitude varies from 12,942 feet on the Chánsil ridge to about 7,000 feet at pillar No. 25, where the outer boundary crosses the Dedra gád.

57. *Rock and soil.*—Similar in character to that of Kotigád, but the soil is usually more superficial, and rocks are more frequently exposed.

58. *The stock.*—Along the Chánsil ridge there is a broad belt of dense forest composed of karshu, rai, and morinda, or there are bare precipices; lower down on precipitous ground some of which is unworkable, there is a forest of deodár, sometimes pure, sometimes mixed with a variable proportion of rai and morinda, and some moru, whilst on similar ground near the outer forest boundary, the rai and morinda disappear and kail mixes in with the deodár, accompanied by the moru or bán oaks and buráns. The density on these slopes is extremely variable and there are numerous blanks in the Duchánu, Jágta and Dedragád blocks, whilst compartment 1 in the Boktáragád block is mainly grass land. On moderate slopes with northerly, north-westerly and westerly aspects there is usually a dense forest of rai and morinda with some kail, deodár, moru, and bán, the deodár being found chiefly on the ridges. Broad leaved species occur principally bordering on streams, moru, horse-chestnut, birch and bán being the most frequent; there are some hill toon along the Dedragád and a few box trees in compartment 3, Tára Mundal.

The deodár on the more precipitous slopes are usually branchy and badly-grown and do not reach a great height; there are, however, some very fine trees in the forest and the Andrigád basin is a very rich one. The whole of the forest is above the chír zone, the others being represented as follows:—

	Acres.
Deodár	6,100
Karshu	5,705
Total ...	11,805

59. *Reproduction.*—This is generally unsatisfactory, morinda seedlings only being common in the dense forests on northerly slopes, whilst elsewhere it is very deficient, which may be perhaps due in a great measure to fires, but in places young kail are coming up on blank slopes, and there are a fair number of deodár seedlings in compartments 2 and 4 of the Andrigád block as well as some seedlings of rai, morinda and kail. It is to be hoped that now fire protection has been started, an improvement in this state of things will soon be visible.

60. *Summary.*—Thus we see that in these forests there are large areas of precipitous ground, especially on southerly aspects, and that in some forests much of this ground is unworkable especially in the Chánsil, Sáhlra, Noránu and Dátmir forests. On the more favorable aspects there are however large areas of moderate evenly sloping ground, especially in the Lambatách, Kotigád, Sáhlra and Naintwár forests. Along the upper portion of all the forests there is a belt of variable width of karshu and the firs; lower down on southerly slopes and on nearly all precipitous ground there is an open forest of pure deodár, whilst on the cooler slopes with steepish gradients there is

usually a mixed forest of deodar, kail, rai, morinda and oaks and where the slopes are gentle there is a dense forest of rai and morinda, with a sprinkling of broad-leaved species below. In the lowest parts of the Deota forest below the line of precipices there is nothing but chir. The area of the different zones is roughly estimated as follows :—

	Acres.
Chír	2,080
Deodár	2 ,660
Karshu	13,028
Box	430
Total ...	45,198

In the deodár zone reproduction is as a rule good in the Deota, Lambatách, Kotigád, Bamsu, Sarás and Dátmir forests, which have been fire-protected for some years, with the exception of some of the most exposed and rocky of the southerly slopes and of some favorable slopes where the cover is too dense. The deodár seeded abundantly in 1878 and 1881, and throughout the forests there are numerous seedlings from these two years, but specially from the latter when the ringál seeded and died. In the forests which have not been fire-protected reproduction is much more backward *e. g*, in Chánsil, where it is usually very unsatisfactory, and in the lower parts of Sáhlra, where fires appear to have been frequent, although in Naintwár reproduction is usually fair.

62. The climate is very similar in its general features to that of Mundáli in the same division and described by Mr. Fernandez in his working plan for that forest. It will suffice to point out here that the only important difference is the greater dryness of the Tehri forests owing to their situation nearer the snow ; thus from observations which have been made at Deota it would appear that the average rainfall is not much over 40 inches as compared with 60 at Chakráta.

CHAPTER III.

Past Management.

63. *Protective charges.*— The following ranges and beats have been established :—

Range.	Number of beat	Name of forests.	Name of blocks.	Area of beat.	Head quarters of beat.
				Acres.	
Deota (in charge of a Ranger.)	1	Deota (pt. of) ...	Pártil, Temple Dopta, Katatach, Jaurási, Kánga, Patangni and Kimari.	3,798	Deota.
	2	Ditto ...	Tádiár and Bhaglár ...	1,139	Tadiár.
	3	Bamsu, Saras and Kotigád (pt. of)	Pipal, Dhikuri, Bamsu, Damráli, Kánda and Bálcha.	4,037	Bamsu.
	4	Sáhlra and Noranu,	All blocks ...	10,930	Sáhlra.
	5	Naintwar and Dátmir.	Naintwár and Dátmir ..	6,010	Dátmir.
			Total, Area ...	25,914	
Kotigád (in charge of a Forester.)	1	Lambatách (pt. of),	All blocks except Dhámti and Thanwára.	2,028	Lambatách.
	2	Lambatách (pt. of) Kotigad (pt of).	Dhámti, Thanwára and Ola ...	3,299	Gokal.
	3	Kotigád (pt. of) ...	Murali and Gokal ...	2,152	Cheo.
	4	Chánsil ...	All blocks ...	11,805	
			Total, Area ...	19,284	

64. *Fellings.*—Departmental timber operations were begun in these forests in October, 1869, but on account of the extreme cold and snow very little was done during the financial year of 1869-70. Colonel Pearson in the annual report for that year says.—" The work in the Tons has been commenced under great difficulties from the daily increasing scarcity of labor in the hills, and the difficulty of keeping up a

regular supply of food for large gangs of workmen in a country as yet unprovided with roads. The bites of the "potu fly" also are a terrible scourge to plainsmen, and just before my return to the Tons last June, 180 pair of sawyers all bolted off, declaring that nothing should induce them to work in such a place. This has necessitated the collection of hill-sawyers, whose work is of much inferior quality to that of the plainsmen and in the meantime sawing is nearly stopped." However, by perseverance and judicious management the prejudices of the sawyers were eventually overcome and work goes on steadily now without any mishaps.

The first forests to be worked were Dátmir and Lambatách, and from the latter forest the last timber was exported in 1875. In March, 1876, the Deota forest was tapped and ever since that date work has been carried on there in a proper and systematic way, compartment by compartment. The outturn from 1869-1885, when the old lease expired was about 6,50,000 deodár sleepers, about three-fourths being metre gauge.

65. The following number of deodár trees have been sold standing to contractors:—

		Green.	Dry.	Price per tree. Rs. a. p.
1881-82, Dedragád	... ...	918	59	8 2 0 to Rs. 4.
1884-86, Andrigád	... ...	1,801	229	11 8 0
	Total ...	2,717	288	

66. The number of trees felled is given below, but it cannot be stated with exactitude, as the returns for the earlier years do not go into details:—

		Number of trees.
Departmental operations,	1869-74, Dátmir ...	3 000 estimated.
	1870-75, Lambatách ...	3,600 about.
	1876-85, Deota ...	10,241 (including 4,665 dry trees)
Trees brought by purchasers—Chánsil	...	3,005 (including 288 dry trees.)
Free grants, about	...	600.
	Total ...	20,446

67. The details of the fellings made in the Deota forest are as follows; it is regrettable that the past records do not admit of a more definite statement:—

Year of fellings.	Number of trees felled. Green.	Dry.	Blocks and compartments.
1876 ...	234	842	Pártil 2 and 3.
1877 to 1880 ...	2,175	3,326	Pártil 3, 4 and 5. Temple 1, 2, 3, 4 and 5. Dopta 1.
1881 ...	535	27	Dopta 1 2 and 3.
	23	3	Temple 2 and 5.
	19	167	Katatách 5.
1882 ...	680	45	Katatách 4 and 5.
	13	17	Temple 5.
	24	10	Dopta 3.
1883 ...	183	5	Katatách 3 and 4.
	347	57	Jaurási 3 and 4.
1884 ...	469	79	Jaurási 4 and 6.
1885 ...	874	87	Jaurási 4 5 and 6.
Total ...	5,576	4,665	

63. *Protection from fire.*—Fire-protection was started in 1872, the first forests to be protected being Dátmir, Lambatách and Deota, then in 1877 the Bamsu and Saras forests, as well as part of the Kotigád forest and the Dhámti block of Lambatách were taken in hand, whilst in 1885 the newly demarcated forests of Chánsil, Sáhlra, Noránu, Naintwár and part of the Kotigád were regularly protected for the first time, so that now, with the exception of some open grassy slopes, the whole of the

forests included in the working circle are under fire-protection. The results from the beginning may be thus tabulated :—

Name of forest	Area attempted.	Fires.	Area protected.	Total cost up to 15th June, 1881.	Year when protection was commenced
	Acres.		Acres		
Lambatách	2,883	392	2,491		1872
Deota	4,937	1,303	3,634		..
Bamsu	2,323	Nil	2,323	3,102	1877
Sarás	1,234	Nil	1,234		..
Kotig'd	5,076	Nil	5,076		1877-85
Chánsil	11,805	Nil	11,805	...	1885
Sáhira	9,410	Nil	9,410	...	...
Noráná	1,520	Nil	1,520	...	...
Naintwár	3,450	50	3,400	...	...
Dátmir	2,560	50	2,510	186	1872
Total ...	43,198	1,795	43,403	3,288	

Thus not quite 4 per cent of the total area has been burnt since protection was begun. The principal fires occurred in the chir forests abode Tadiár and in the Dhamti block of the Lambatách forest, both of which are particularly difficult to protect owing to the quantity of long grass with which they are covered. One of the chief causes of the fires which have happened has been the carelessness of the establishment when burning the fire-lines.

69. The outer boundary being about 106 miles in length fire lines have to be burnt for the same distance, except that it is not necessary to burn parts of the natural boundary, especially along the Chánsil ridge. There are also 18 miles of interior fire lines, *viz* :—

Miles (approximate)—

Deota	11½
(Leositách to Palli dhár and Chabai, along road from Tadiár and along sledge road)—	
Lambatách	6½
(Samání and Lohásu dhárs and Thanwára)	
Total ...	18

so that 350 acres are protected for every mile of fire-line. Interior fire-lines were also formerly burnt from Patángni to Chabai and from Patángni to Kimári which have been given up as they were not required. A fire-line was also made down the Nainitách dhár at Lambatách, but this has also been abandoned, the dhár being a rocky one and fire difficult to control.

Some portions of the forest, especially those above 8,000 feet, and all the dense fir forests, are difficult to burn and would often escape without fire-lines; but it is impossible to separate them from the regular deodár forests, and such damp localities help to check the spread of a fire, rendering protection much easier; so that fires when they do occur in the deodár forests are never very extensive.

That protection is, however, essential to the maintenance of the forests, if they are to be worked systematically, I venture to assert that no one who has visited those blocks which have been protected for many years will deny. The westerly slopes of Lambatách are particularly favorable examples of the wonderful results of such protection (*vide* paragraph, 50.)

Protection from grazing.

70. The following forests are now closed to grazing :—

	Acres.	Date of closing.
Dátmir	1,860	1872
Lámbatách	2,863	1874
Deota	4,937	do.
Bamsu	2,323	1879
Sarás	1,234	do.
Kotigád (except Gokal block) ...	3,968	do.
Total ...	17,205	

In this area, however, cattle, sheep and goats are admitted by special permission of the divisional officer to the higher portions of the forests above the deodár zone during four or five months in the year. In 1881-82 and in the succeeding year, portions of the Banárpáni from and Chakoria blocks of the Lambatách forest were opened to sheep and goats for about three weeks, with the hope that the flocks would somewhat clear the ground of the dense undergrowth and herbage which has sprung up since the ringing operations, and which is prejudicial to the growth of seedlings; but the experiment was not successful. In 1883 84 the Kánda block was also opened for cattle grazing during the rains.

The newly demarcated forests are open for grazing purposes to the few small neighbouring villages.

Plantations.

71. A record has been kept of planting work in the Lambatách and Deota forests, but owing to frequent changes in the mode of recording the work done, it is almost impossible to obtain a clear account of what has been carried out, and it was agreed upon last November with the divisional officer that the ranger should mark all the plantations on the new maps and write a short account of them but, owing to pressure of work, this has not been done. The following account gives as much information as can be gathered from the records.

The areas planted or sown up are approximately :—

						Acres.	
Lambatách	..	...	...	...	...	135	
Deota	...	...	...	...	...	43	
				Total	...	178	Deodar.
				Datmir	...	2	Box.

Lambatách.

72. (1) *Chakora.*—In 1878-79 12,260 pits in lines 20 feet apart and about four feet apart in the lines were sown with deodár at a cost of Rs. 2 14-0 per acre, and in 1884-85 about 1,000 seedlings were planted out under young kail.

(2) *Garásna.*—In 1881-82, in a part thickly covered with indigofera scrub, 50 spaces ten feet in diameter were cleared, and in them were planted groups (five per space) of the best deodár plants from 1′ to 1½′ high that could be obtained from the forests, and about half have succeeded. In 1884-85 about 1,000 deodár were planted out under young kail, and in the next year 1,000 pits were sown with 1½ seers of deodar.

(3) *Dhámti.*—In 1881 about 20 acres of grassy slopes were sown up with deodár and blue pine in 11,800 pits in vertical lines 15 feet apart; but although germination was good, the majority of the seedlings succumbed to drought and hail.

In November, 1882, 30,000 pits in horizontal lines 15′ × 5′ and covering about 50 acres were sown with kail, but most of the seed, which does not germinate until the rains, was eaten by birds and mice and the pits had therefore to be resown in May, 1883. Most of the seedlings however died off owing to the drought, and 21,200 of the old pits were resown in July, 1885, with 26 seers of kail at a cost of Rs. 136. The germination was as usual magnificent, but the young plants began to die off rapidly and 23,600 pits had to be resown in December, half with deodár and half with kail. Grass shades were placed over some of the young deodar during the hot weather, and the following results show the necessity of resorting to this plan, which has been followed with success at Deoban for many years past.

Pits sown with deodár, not shaded artificially :—

Successes	...	...	...	...	...	4,370
Failures	...	...	...	...	...	18,311
				Total	...	22,681

Pits similarly sown, but shaded artificially :—

Successes	...	...	...	...	...	4,486
Failures	...	...	...	...	...	514
				Total	...	5,000

(4) *Ghoria.*—In November, 1881, about four acres were sown with deodár seed, the number of pits being 2,350, in vertical lines 15′ × 5′ ; but, although germination was good, most of the seedlings subsequently died owing to the drought, and the area had to be planted up in 1884-85, but one-third of these plants have also died.

(5) *Banárpáni.*—In 1882-83 1,049 spaces 10′ × 10′ and about 30 feet apart were cleared in the thick undergrowth produced by the former ringing operations, and five strong nursery plants were put into each, but one-half damped off owing to the bad drainage of the ground.

Deota.

73. (1) *Pártil.*—In 1881-82 about 50 acres were planted or sown with deodar and 22,250 seedlings were collected from forest paths and put into nurseries, 2,140 of the best plants being planted out in the moist ravine near Leositách where firs had been ringed in 1878. In 1882 83 3,420 deodár were planted out, in 1883-84 1,786, and in 1884-85 about 1,000.

In the plantation made in an indigofera scrub in 1882, which was examined this year by the forest school, the percentage of success was as high as 92, the average height being 53″ and girth 3 5″ whereas in 1884 the average height was only 25″.

(2) *Temple.*—In 1882 over about 2½ acres above the Temple 91 spaces were cleared and planted up with 455 deodár plants, and in 1883 about half an acre was planted up with deodar near the central path towards the Dopta Khad amongst indigofera scrub, and the Forest School this year found that the successes were 84 per cent. and the average height of the young plants 21.″

(3) *Jaurási*—In 1882 3½ acres above the new sledge road were planted up with 1,813 deodar in lines of pits 15′ × 5′, and in the following year the plantation was extended along the dhár on both sides, 70 spaces and 1,843 pits being made. This was examined by the forest students this year and the successes amounted to 83 per cent., the plants having an average height of 3′ 11½″ and girth of 2¾″. A quantity of natural kail is coming up with the deodár.

Altogether in Deota there are now about 30,000 pits stocked with deodar or a little over four young plants for every green tree cut.

74 *Bátmir.*—One thousand four hundred box plants which had been collected from the forest and placed in a nursery in 1883 were planted out over a blank of two acres in 1885.

75. *Cleanings of kail over deodár.*—In those portions of the Lambatách forest where deodar is associated with kail and on many of the blank grassy slopes, an abundant growth of the latter species has sprung up, since the protection of the forest from cattle and fires. The seed of this pine is light, and has a large wing, and is therefore carried by the wind to great distances, whilst it requires no shelter and springs up readily on open blank spaces. In the Thanwára, Lohásu, Garásna and Chakora blocks there are extensive thickets of this pine from 10 to 30 feet high with usually a fair number of deodár seedlings underneath them. Owing to the extremely rapid growth of kail in its youth it was at first feared that nearly all the young deodar would be choked by its more robust companions, a pure forest of kail being the result. In 1881, therefore, over 36 acres in Chakora and over four acres in Garásna, where it was feared that the young deodar were being choked, the smaller kail trees were entirely cut away, while the larger trees were ringed. This operation was continued the following year over an additional 75 acres, but it was found that the exposed deodár, rendered delicate by the cover of the kail, became yellow and were bent down by snow, and it was ordered in future that the kail should only

be removed in places where the deodar was really suffering from its cover, and that, as a rule, only the lower branches of the kail were to be lopped off. It was considered that a certain proportion of kail was extremely useful as affording lateral protection to the young deodar, which frequently lose their vigorous appearance and become yellow if suddenly exposed ; whereas isolated deodar which has grown always in the open is not so liable to this delicate appearance provided the drainage is sufficient. Up to date cleanings have been made over the following areas :—

	Acres.
Thanwara	510
Chakora	120
Lohásu	205
Garásna	105
	940

The cost of these operations necessarily varied according to the mode in which the thinnings were made, and to the density and frequency of the kail thickets in the area worked over. Thus in the earlier years when most of the kail was either cut out or girdled, the cost was from Re. 1 to 10 annas per acre, whilst latterly it has been as little as 1½ annas per acre.

76. *Ringing inferior species.*—The operation of killing spruce and silver fir by ringing was begun in 1874 and has been continued ever since. The ringed trees die in about 18 months the silver fir dying sooner than the spruce. The areas which have been subjected to this operation are—

		Acres (estimated only.)	Date of ringing.
Lambatách ...	Banárpáni	140	1874 78.
	Chakora	130	do.
Deota ...	Lártil (upper part)	200	do.
	Temple 3	45	1881
	,, 4	50	1882
	Kánga 4	20	1885
	,, 5	10	1886
	Patangni 4	70	1885
	Kánga	20	1886
		685	

At first the system adopted was in Lambatách to strip off a belt of bark 1½ feet to two feet broad, while in Deota a ring six inches broad and two inches deep was cut into the wood. In both cases the trees, as a rule, died during the second year, but the first-mentioned system being the cheaper of the two is now only employed. In the earlier operations in Lambatách too great a proportion of the spruce and silver fir were ringed, the result of the admission of so much light on the rich and moist soil being a luxuriant growth of shrubs and herbs which have almost completely prevented deodár seedlings from springing up. Benefiting by the experience thus gained, in the Temple block only such rai and morinda as were interfering with the growth of the neighbouring deodár were killed, and great care was taken not to lay the ground bare. Finally it was considered best to ring the trees a considerable time before the selection fellings of deodár were made, in order to throw light upon the ground, so that when a favorable seed-year occurred the place might be speedily covered with seedlings of deodár, and so the ground would be well stocked with advanced growth before cutting out the mature deodár, but in order to avoid the danger of a crop of brambles and other shrubs by the admission of too much light, it was considered prudent to remove the inferior species very gradually and to go over the same ground two or three times at intervals of several years. Thus these operations in the Kánga and Patángni blocks have preceded the fellings. It is also now intended at the time when the trees are ringed to remove all low bushes, &c , and to roughly prepare the ground under seed-bearing deodár.

It has also been found cheapest to do the ringing in April and May when the bark can be readily removed ; thus in 1881-82 when the work was done at this season the cost was one and a half pie per tree only, whereas in the following year when it was done at another time the cost per tree was over one anna. In addition to the spruce

and silver fir other inferior species such as moru, bán, karshu, buráns, ayár and kail are now also ringed.

77. *Other cultural operations* —In 1881 Mr. Moir tried the experiment of clearing about 225 spaces at different distances from seed-bearing deodár trees and found that the seed was carried to distances varying from 50 to 100 yards according to the slope of the hill; the seedlings were, however, killed by kail or eaten by birds, and the result was not on this occasion satisfactory. He also dug up the ground in parallel lines in the neighbourhood of seed-bearing trees and subsequently found the lines fairly well covered with seedlings to a distance of about 50 yards from the parent trees. Some patches have also been cleared in the indigofera and desmodium scrub in order to encourage deodár reproduction, and the results have been fairly successful; but in all cases where the soil is prepared it will be better to sow up artificially instead of awaiting natural reproduction, as the cost of sowing, once the ground is prepared, is a mere trifle.

78. *Deodár oil.*—In March, 1886, eight maunds of deodár chips were placed in an apparatus consisting of two gurrahs and a lid and plastered over with 30 maunds of clay. This was heated above with 80 maunds of fuel, and one maund 30 seers of deodár oil was obtained. The cost was Rs. 11-11-0 or 0-2-8 per seer of oil.

79 *Iron.*—It was thought possible to utilise the refuse wood in the forests in the manufacture of iron, and Dr. Warth visited the division in 1881 in order to investigate its iron resources, but discovered no mines which could be worked profitably.

80. *Communications and buildings* —Fifteen years ago there were no roads or pathways whatever in the working circle, nor any connecting it with the neighbouring country. A great improvement on this state of things has been inaugurated by the Forest Department, and the following roads and pathways have been made in connection with the Tons forests.

		Length in miles.
1.	The Chakráta-Tons road (with a branch to Maindrot) ...	45
2.	„ Tons river path	55
3.	„ Sáiah-Tons road	15¼
4.	„ Arakót-Andrigád road	11
5.	„ Deota-Lambatách road	6
6.	„ Deota Bamsu road	5
7.	„ Outer boundary path of the Lambatách, Deota, Bamsu, Saras and Kotigád forests	37
8.	Jaunási dhár road nearly ...	¾
9.	Inspection paths in the forest, about	20½
	Total ...	195½

81. The Chakráta-Tons road is from six to eight feet broad and is passable for ponies and pack-animals. It was begun in 1870, when 35 miles were constructed from Deoban to Maindrót, and thence along the left bank of the Tons to Tiuni bridge, the line being excellently chosen and the work well and cheaply executed at a cost of about Rs 360 per mile In 1876-77 it was carried on to the Tadiár bridge, a distance of four miles for less than Rs. 1,000, and from the bridge the road was continued right up the hill to Deota, a further distance of 6¾ miles at a cost of a little over Rs. 3,500, this part of the road having to be carried through some very precipitous ground where the blasting work was very heavy. The road is an exceedingly useful one, for, besides opening out the Jaunsár forests, it connects the Tons sleeper works with the plains, and is the road along which the whole food supply for these works is brought from Chakráta. It is the main road through the upper portion of Jaunsár and a grant in aid of its maintenance is now made by the district board.

82. The Tons river path, which cost Rs. 5,000, and was passable for a pony, was made for the double convenience of the gangs of men employed in floating sleepers down the river and for the import of grain to the forests during the winter months,

when the snow prevents the Chakráta-Tons road being used. The part which passes through Sirmúr territory has now, however, fallen into disrepair owing to certain difficulties which have arisen between that State and the Forest Department. The Sáiah-Tons road from Sáiah on the Chakrata-Sharunpur cart-road to the Minis gád was also made in order to facilitate access to the chír forests during the winter. It was at first in 1878-79 made three feet broad but was widened next year, costing altogether about Rs. 4,500.

83. The Arakót-Andrigád road follows the course of the Koti gád from its mouth at the Arakót bridge to the Andri gád beyond the village of Cheo, the last three miles beyond that village having been made by a timber contractor in 1884 85.

The Deota-Lambatách and Deota-Bamsu roads connect the rest-houses of these names, whilst the outer boundary path serves the treble purpose of a boundary line, an inspection path, and a fire-line. The road to the Jaurási dhár was made for the carriage of food-supply and of sleepers. The inspection paths are usually about two feet wide and some of them are also utilised for the carriage of sleepers; they cost from 7 to 8 annas per chain.

84. In addition to numerous culverts on the various roads, seven important bridges have been built, *viz.*, Tiuni, Maindrót, Tadiár, Dátmir, Naintwár, Arakót and Cheo.

A wire-rope suspension bridge at Tiuni was built in 1870-71 by an officer of the Royal Engineers, but it collapsed the same year and was rebuilt by Mr. Moir. It was made over to the Dehra Dún district authorities in 1874-75, and in 1885 it was entirely rebuilt by Mr. P. McKenzie, Executive Engineer, who has written a paper giving the details of its construction, with drawings. The Maindrót suspension bridge was built in the same year as the one at Tiuni. It was necessary on account of sleeper operations having commenced in the Lambatách forest, and all the supplies for the workpeople having to cross the Tons at Maindrót, but now that these works have long ceased, repairs have been neglected, and it has been determined to pull it down as it is unsafe and no longer of any great use In the annual report for 1876-77 the Conservator says that " the wire suspension bridge over the Tons at Tadiár has been completed very satisfactorily at a cost of Rs. 2,864. It is the steadiest bridge of its kind I have ever crossed; the span is 146 feet and the road-way six feet broad. All grains, stores, &c, for the Deota works cross the Tons by this bridge." In 1878-79, it was repaired at a cost of Rs. 503.

At Dátmir a suspension bridge was built in 1871-72 for Rs. 700, and it was repaired in 1885-86 for Rs. 93. In the same year at Naintwár trees were given and the inhabitants put up a good, firm, wooden bridge under the superintendence of the forest officer, and this was repaired in 1884-85. In this year the old pahári bridge at Arakót was completely reconstructed at a cost of Rs. 572 on the old hill system. The span is 87 feet. The piers are constructed of rubble masonry tied together with wood. Into these are fixed three layers of beams slightly inclined upwards, each layer rather longer than the one immediately under it; the layers are supported on each other and the uppermost layers are the main beams of the bridge. The bridge above Cheo is a capital wooden structure built by the timber contractor working in the Andrigád in 1884-85.

85. The principal buildings which have been erected are—rest-houses at Maindrót, Lambatách, Deota, Tadiár and Bamsu. The Maindrót rest-house was built in 1873-74, and was conveniently situated for visiting the sleeper works at Lambatách, but since this forest has been worked out, the house has been allowed to fall into disrepair and has now been abandoned. The Deota rest-house and two godowns were built in 1875-76 at a cost of Rs. 2,906 and subsequently an office, a house for the head-clerk and other minor buildings were put up; for forest guards there are huts at Deota, Lambatách, Gokal and in the Kotigád forest; there is a dák runner's hut in the

Dharmigád forest. The Gokal chauki is on a piece of ground which has been taken up as a camping-ground near the village Two substantial food godowns were built near Cheo in 1885 by the contractor who has been working out deodár from the Andrigád forest and these godowns when the works terminate may be utilized as forest chaukis. With the exception of the rest-house at Maindrót all the buildings are kept in good repair. Last year also rest-houses for students of the Forest School, who visit these forests annually, were built at Deota and Tadiár, there being a range of eight rooms at the former and of 10 rooms at the latter spot.

A water-duct one mile and a quarter in length was made in 1885, from the Katatách khud to the lower sledge road depôt to supply water to the sleeper-carrying coolies. The cost was Rs. 250.

CHAPTER IV.

Demands for Produce and Lines of Export.

86. The only demand which can at present be met from these forests is for deodár sleepers. There is a considerable demand for wood for tea boxes in the Dún and the spruce and silver fir have proved excellent for the purpose, but the cost of transport at present prohibits this market being opened out. Of late also there have been enquiries made regarding the cost of the delivery of these woods for paper making purposes, and this may in the future give rise to a very important industry. Some years ago it was proposed to establish a factory for the impregnation of pine sleepers from the north-west Himálaya, and in 1878 Sir D. Brandis and Dr. Warth wrote memoranda on the question, but the project has not been carried out. The Manager of the North-West State Railway, however, issued a circular last year stating that he wished all his sleepers to be prepared in India in future, and that he was willing to buy firs and pines as well as deodár. To supply the sleeper market, over six lakhs of sleepers, of which about three-fourths were metre gauge, have been exported from the working circle under the old lease. The broad gauge sleepers were sold to the Agra and Scindia Railway, but now only metre gauge sleepers are exported, and these are all taken by the Rájputána-Málwa Railway now amalgamated with the Bombay and Baroda lines: a few broad gauge sleepers were also disposed of to the Executive Engineer, Muttra Bridge, and to the Gun Carriage Factory, Fatehgarh, whilst some metre gauge sleepers were taken by the Muttra Provincial Light Railway.

87. The rails on the Rájputána-Málwa line, which was constructed between 1870 and 1876, were originally laid on transverse deodár and creosoted pine sleepers. The pine sleepers, which are perishing very fast, are being renewed with good deodár sleepers. The Fazilla branch is laid with steel sleepers and Denham-Oliphant's iron sleepers. The length of the Rájputána-Málwa system is as follows:—

	Miles.
Rájputana-Málwa Railway	1,123¼
Rewári-Ferozepore	290¾
Total ...	1,414

The Bareilly-Pilibhít Railway, 36 miles long, is laid with metre gauge sleepers, partly deodár and partly sál. In 1885, the Bombay-Baroda line required about 1,75,000 sleepers annually, and in the following year a three-years' agreement with this company was concluded for the delivery of one lakh of sleepers per annum at the rate of Rs. 1-11-0 per sleeper, the sleepers to be branded at the Dákhpatthar depôt by an Assistant Engineer and the railway to accept all such branded sleepers which arrived unbroken at Delhi.

The size of a broad gauge sleeper is $10' \times 10'' \times 5'' = 3{\cdot}47$ cubic feet, and of a metre gauge sleeper $6' \times 8'' \times 4\frac{1}{2}'' = 1{\cdot}5$ cubic feet.

88. The price of sleepers has declined considerably since 1871-72, mainly owing to the large exports from private forests, as the following figures show : —

			B. G.	*Per c ft*	*M. G.*	*Per c. ft*
			Rs.	Rs. a. p.	Rs.	Rs. a. p.
1871-72	...	...	4-13	1—6—2	2-12	1-13-4
1876-81	...	...	4-0	1—2—5	2 0	1—5—4
1881-86	...	...	3-12	1—1—4	1-14	1 4—0
1886	...	...		...	1-11	1—2—0

Deodár sleepers on the North-West Railway are said to last about 12 years, thus if the Rájputána-Malwa Railway used only deodár sleepers they would probably require annual renewals amounting to 2½ lakhs.

89. Deodar trees can be sold standing to contractors, but the Conservator considers such sales to be prejudicial to our interests, as only a very inadequate price is obtainable, and the sleepers brought down by the purchasers help to flood the market already overstocked with timber from the forests of the hill chiefs, which they are selling as fast as they can at low rates; and they hinder the sale of our own sleepers, a steady demand for which is essential if the forests are to be worked on a proper system (*vide* justification of departmental works para. 136).

The export works made under the old lease will now be briefly described.

90 *Lambatách*.—In this forest a tramway and a slide were constructed for export purposes, and a report on them was made by Mr. Bagshawe in 1873 from which the following information is taken.

The average distance from the centre of the deodár zone to the Pábar, the nearest river available for water carriage is about five miles. A two-foot gauge tramway made of wooden rails and sleepers 5,188 feet long was laid down below the Chakora block along the hillside, the line twisting round small ridges, and again running across small plateaux. As a rule, the cuttings were small and mainly through earth and the line was nearly level The rails of the tramway were keyed into the sleepers with a wooden key which answered well ; it held the rails firmly, was easy of removal and very much cheaper than spikes or screws. When the tramway was first made, the use of four-wheeled trucks was proposed like those used at Mandhol, but experiment showed that on a line with so many sharp curves on it, this mode of carriage would be both slow and expensive. The two-wheeled truck (see drawing No 1,) capable of carrying twelve sleepers at a journey was therefore devised by Mr. Greig as a substitute, and answered admirably throughout. As it was found that when the body of the truck was fixed on the axles and the axles fixed on the wheels, there was no play whatever and the trucks would not go round the curves, this was remedied by making the wheels revolve on the axle instead of being fixed to it, whilst the carriage moved on the axle on an iron pivot. This truck required two men to work it.

The price paid for running the sleepers along the tramway was at first 4 pie and later on 3 pie per sleeper, 5 per cent. on the total price being paid to the head man of the gang employed. In all 92,968 sleepers were thus carried by about 25 men in about seven months. The tramway cost Rs. 3,150 and by its use a saving of Rs. 1,400 was effected.

91. The slide was a dry one (*i. e.*, the moving power was the momentum given to the sleeper by the fall in the gradient of the slide, not water-power). It was formed of three kurries 13′ × 12″ × 5″ wedged in block sleepers (short logs) with a nick cut in them to form a bed for the kurries, a small quantity of water was introduced at intervals to remove the danger of fire from friction between the sleepers and the bed of the slide. The length of the slide was 1 mile and 1,052 feet, and the total fall was 2,687 feet. When the line was first selected, it was at once foreseen that two great difficulties had to be overcome, (1) to prevent the sleepers leaving the bed of the slide—(2) to check their velocity while in transit. The depth of the slide was at first seven

inches, and it was thought that the use of brakes placed at intervals would overcome the difficulty. Trial brakes were at first put up with light one-inch planks hanging down, at intervals of 100 feet, but no successful results were attained. The distance between the trial brakes was then shortened, and two and three-inch planks used, but still the velocity of the sleepers remained unchecked; finally brakes were tried 15 feet apart, but even this was of no avail It was then resolved to divide the slide into two sections, cut down the depth to 5½ inches and cover it throughout by fixing planks to the top. This covered-in slide proved a great success, although it had to be worked carefully. The sleepers went down the slide about three per minute, but Mr. Greig thinks, if necessary, they might have been sent down at the rate of ten per minute. At the bottom of the slide a pool was formed by damming up a breach of the Pábar river; this pool was about five feet deep, all the sleepers came into it and were carried out of it down the waste-water channel to a line of boulder stones where they were taken out, stacked and made over to the floating contractor. The number of sleepers damaged in transit was from 2 to 3 per cent. The slide cost nearly Rs. 11,000, and it is estimated that the saving effected by its use was nearly Rs. 10,000. The cost of sending sleepers down the slide was about Re. 1-8 per cent. The lower half of the slide was burnt in 1873 and reconstructed by removing a portion of the upper section which was not replaced.

92. Altogether 158,224 sleepers were sawn up in Lambatách, of these 38,142 sleepers were in Thanwára, the most northern part of the forest; these sleepers were collected in a depôt at the top of the final descent and thence carried on men's backs down to the river @ 2 annas 6 pies each. The remainder of the sleepers all went down the slide.

93. *Deota.*—The export works which have been constructed in this forest and which are still in use have been described by Mr. Moir in his report on the Deota sledge road, dated 5th September, 1885, which may be briefly summarised here. The two principal export works are the slide and the sledge road.

The slide, which is 12,192 feet in length, was constructed during 1876-78 at a cost of Rs. 26,000, whilst up to the end of March 1885 Rs. 7,988 have been spent on repairs. The gradient varies from 5 to 22 degrees, the best gradient being about 15 degrees, and the total fall is 1,300 feet. It consists of a trough composed of three beams, 12′ × 13″ × 5″ roughly jointed and firmly wedged into block sleepers. These beams which are of chír, have been found only to last three or four years at the longest, so that the entire slide has had to be reconstructed more than once. It would have been much cheaper in the end to have made it of deodár, as this wood lasts indefinitely in the hills, whilst chír rots in two or three years when exposed to alternations of heat and moisture. The inside measurement of the slide is 13 inches wide by 8 inches high as it was originally constructed for the sliding of broad gauge sleepers; for metre gauge sleepers a lighter slide measuring 6′ 3″ × 8¼″ × 4¾″ would suffice. There are in all eight main bridges varying from 30 to 70 feet in length, as well as several heavy rock cuttings and retaining walls 20 to 25 feet high The slide is worked by means of a good flow of water, which is let in from the Bagiár nala by means of troughs situated about a quarter of a mile apart, very little water being required when the gradient is of 22 degrees, but a plentiful supply of water being absolutely necessary when it is less than 18 or 20 degrees. The slide is principally worked during the rains, as there is not sufficient water available at other seasons, except during February, after the melting of the snow. With a good supply of water a sleeper takes about ten minutes travelling down the slide, and 1,200 sleepers can be slid in one working day of 10 or 12 hours. On arrival at the Tadiár depôt on the banks of the Tons, the sleepers are thrown out of the slide by means of a kind of table provided with a slanting beam against which they strike and they are then stacked. After the monsoon or during February the sleepers are slid directly into the Tons, but this cannot be done during the floods. Since its completion to the end of March, 1885, 407,800 sleepers, of

which 135,000 were broad gauge have been exported by its aid and the saving this effected has been estimated at Rs. 15,014.

94 *The sledge road* is the first of its kind in India, and was constructed in 1883-84 principally under the direct supervision of Mr. Hobart-Hampden, at a cost Rs. 3,587, including ten sledges. The total length of the road is 6,877 feet, including 20 bridges aggregating 1,068 feet in length. The amount of hard rock-cutting requiring blasting was about 14,000 cubic feet, and there are nearly 7,500 cubic feet of retaining walls. The gradient varies from 5 to 11 degrees, the average being 8 degrees, and experience has shown that the best gradient is from seven to eight degrees Some of the curves are extremely sharp, having a radius of 20 to 22 feet only. The fall in the total length of road is 835 feet.

The construction is as follows:—Two lines of metre gauge sleepers (from rejections in the forest) were laid down longitudinally 2 feet 9 inches apart, the ends being jointed and firmly fixed by means of moru pegs; across these, at distances of two feet six inches apart the transverse sleepers are placed and these are either jointed or pegged to the lower sleepers by means of moru pegs, but on bridges and sharp curves, 6 inch nails are used. Across the upper sleepers are cut the grooves in which the sledges run; they are situated two feet apart, and have breadths varying from four to six inches, according to the curves, their depth being from half to three-quarters of an inch. The centralportion of the roadway between the longitudinal sleepers is ballasted up toa level with the transverse sleepers, which prevents any shifting. The sledges in use are 8½ feet long, two feet seven inches wide (outside measurement) and three feet nine inches high and consist of two strong wooden runners placed two feet two inches apart into which the uprights forming the front part of the sledge are firmly fixed. The front uprights against which the sleepers rest are bolted together by means of two or three light bolts, and all the joints are firmly secured by means of iron plates and pivots.

The runners as they get worn down have soles attached; these soles and the runners are made of moru, whilst the rest of the sledge is made of sh sham. A sledge requires two men to work it and it is brought back to the upper depôt on one of the men's shoulders. The number of sleepers carried per sledge per day varies from 100 to 120 and the rate paid is 2-4 pies per sleeper compared with one anna paid formerly for carriage on coolies' backs. It is estimated that a saving of Rs. 5,600 will be effected by the use of this road besides great saving in labor which is difficult to secure at all seasons. There is a break of very precipitous ground between the end of the sledge road and the slide, the drop being about 2,000 feet and sleepers are carried down this place to the head of the slide by coolies.

A dry slide on a similar principle to that at Lambatách has now been made for 1,452 feet, but the gradients are greater, attaining over 40 degrees in some places. Hence the use of breaks is absolutely necessary to regulate the pace of the sleepers and these are supplied by clappers (planks) heavier at the lower end and working on iron axles.

The section inside the slide measured 9″ × 7½″ so as to accommodate broad gauge sleepers, as there has always been an uncertainty about the demand for metre gauge sleepers. It would have been better for the latter if the section had been reduced to 8″ × 5½″ as the sleepers now occasionally turn on their edges and jam against the covering

Slides of this character should be made as straight as possible and of uniform gradient, to prevent sleepers ploughing into the bottom.

The sleepers come down the slide in 35 seconds, but owing to hitches occurring not more than 50 per hour can be passed down.

It is no longer used, owing to the difficulty of stopping the sleepers at the lower end and to the fact that many of them were considerably damaged in transit.

96. In 1881 Dr. Warth endeavoured to erect a wire tramway for the transport of sleepers from the forest to the head of the slide, but he was not successful. The export lines from the other forest will be discussed in chapter VII.

97. These all converge to the Tons, down which all our sleepers will have to be brought. Above its junction with the Rupin there is very little water in it save in the rains; but the river is very free from rocks and other impediments, except between Dátmir and the junction of the Tons and Pánchganga. There is a fall of nearly 2,500 feet from Dátmir to Naintwár, or above 100 feet per mile; and after passing the Pánchganga there should be no great difficulty in bringing down any number of sleepers from that forest during the rainy season.

The distances from the principal points on the river to Dákhpatthar is approximately as under—

	Miles.
Dátmir	85
Junction of Tons and Pánchganga	80
" " Rupin...	76
Mouth of the Kuni gád	70
Tadiár	62
Junction of Tons and Pábar	55

Timber is usually launched about the 15th of October at Tadiár and elsewhere on the Tons, about the 15th of September on the Pábar, and in the Kotigád on the 15th of August. Owing to the nature of the river, sleepers and other scantling can be only floated separately until Dákhpatthar is reached. The men employed on this work are professional mullahs from the two small hill states of Mandi and Biláspur in the Panjáb. The mullahs are divided into two classes, Sernaiwalas, who use inflated goats' or cows' skins, and "Tárus." Food is willingly supplied to the men by the neighbouring villagers, and each workman receives Re. 1 at the end of the week to make the necessary purchases, their accounts being settled on the arrival of the sleepers at Dákhpatthar. This arrangement is found to be much preferable to employing a bania for the food-supply.

The floating gang required for bringing down 50,000 sleepers would be:—

Tindal	1
Sernais	6
Tárus	16
Coolies	12
	35

and the number would not require to be largely increased for double the number of sleepers.

The most troublesome places on the river are the Katán, Khilona, Kilaur, and other 'dandas' or rocky places, and the Hatar, Koti, Anbitta and other 'ghooms' or backwaters. The Katán danda is the most difficult of all, being a narrow rocky gorge over a mile long, and if the river is low it may take a month before all the sleepers are got past it. It could probably be greatly improved by the use of dynamite.

The following account of the Tons and Jumna river arrangements is taken mainly from a memorandum written by Mr. Moir in April, 1885.

98. The rules and regulations under which the control of the timber traffic on these rivers has been established are contained in Notification No. 300 of the 28th February, 1880, amended by Notification No. 1004 of the 2nd November, 1880 and No. $\frac{410F}{129-10}$ dated 26th June, 1885, (*vide* Appendix F). Under these rules and the Forest Act the notice given in Appendix G. was issued by the Conservator of Forests, School Circle.

The villagers along the banks of the river, who are much addicted to timber thefts are, under these notifications, entitled to pick up head loads of all unmarked drift timber and pieces of timber of not exceeding six feet in length and two feet in girth, but are not allowed to burn charcoal, as they might burn sleepers along with the small pieces.

99. *Extent of the timber trade.*—The accompanying statement shows the extent of the timber trade during the past three years :—

Years.	Government timber exported.	Merchants' timber exported—sleepers deodár, chír, sal, &c., chír karis, &c.	Amount of rafting dues received.
	No.	No.	Rs.
1882-83	42,702	2,34,269	7,0 0
1883-84	63,373	4,38,781	11,843
1884-85	64,555	3 20,225	5,091
1885 86	50,688	3,67,732	7,923
1886 87	50,735	3,53,035	6,506

The rafting dues previous to 1884-85 were about double what they now are, hence the difference in the amount realised. The greater part of the timber exported by merchants comes from the native states of Keuntal, Jubal, Taroche and Sirmúr, and nearly all the timber is taken to Delhi.

100. *Floating timber by contract and by Government agency.*—Up to the rains of 1884 all Government timber was floated by Mr. Winton, contractor; the rates paid to him and the cost of floating departmentally are compared as follows :—

	Rate per sleeper paid to Mr. Winton Annas.	*Cost of floating departmentally.* Annas.
M. G. Sleepers from Tadiár to Dákhpatthar	4	1½
" " Dákhpatthar to Delhi ...	6	2
Total ...	10	3½

To the cost of floating departmentally should be added half anna per sleeper for the cost of supervision, &c., so that by working departmentally there is a saving of six annas per sleeper.

101. *The Dákhpatthar boom.*—This boom, intended to catch all timber floated down the Jumna and the Tons, was first put up by Mr. Winton, but it was taken over by the Forest Department in the rains of 1881. The boom as at first constructed was not strong enough to resist unusually high floods, and the upper face being ragged, timber striking against it stuck and then got sucked in underneath instead of sliding along and passing at once into the side bay formed by the line "dauri" The boom has now been reconstructed on an improved principle and the present system is shown in the accompanying plate, *vide* drawing No. 4. The longitudinal pieces are fixed by means of pieces of wire-rope passing through, as bolts would be apt to break in the case of sudden strain being brought against the boom and a certain amount of flexibility has to be allowed. It cost Rs 1,150 including Rs. 500 for hawsers and wire-ropes, which will last many years. The boom is kept up during the cold and hot weather, and removed just before the rains during which season a gang of mullahs is maintained.

102. *Catching timber during the floods*—During the floods of 1884 and especially after the great flood of 1st October, 1884, upwards of 41,000 merchants' sleepers were secured by this department, the total number which went adrift being about 50,000. This great flood rose to within one foot of the floor of the forest chauki at Dákhpatthar and took place at a most unusual season of the year. Some sleepers came from Tadiár in one day, and some were carried as far as Delhi.

103. *Scourage.*—During the transit of the sleepers from Tadiár to Dákhpatthar they are subjected to a certain amount of wear and tear against rocks and so forth. To land a sleeper 6′ × 8″ × 4½ it is quite sufficient to cut it 6¼′ × 8¼″ × 4¾″ in the forest.

104. *Floating to Delhi.*—After the timber is caught at the boom it is bound into rafts consisting of 120 broad gauge or 160 metre gauge sleepers The size of the rafts are regulated principally by the Western Jumna Canal rules, (Appendix H), which stipulate that no raft is to be more than 50 feet in length. As a rule, the timber is only rafted down the canal as far as Dadupur, where it is taken through an escape into the main Jumna to Rájghát. In the case of the canal being closed for repairs, the

rafts are taken over the weir and floated straight to Rájghát. At this place the rafts are broken up and bound into large rafts containing about 600 sleepers and proceed to Delhi.

The canal dues are high, being about Re. 0-1-1 from Bogriwála to Delhi, but only 5-6 pies from Bogriwála to Dádupur hence every effort is made to take the timber down the main Jumna when there is sufficient water. The Eastern Jumna Canal is not suitable for floating on account of the numerous locks and falls, and it is estimated that to render it navigable for timber rafts 27 locks would have to be constructed, and that the cost would be about five or six lakhs of rupees.

105. *Arrangement with the Sirmúr State.*—One of the difficulties connected with the floating of sleepers to Delhi is the fact that the greater portion of the western bank of the Tons is not in British territory, and in consequence timber thefts are numerous. Thus in 1884-85 1,167 sleepers were stolen, and in the following year 2,043. The boom at Dákhpatthar is fixed to a rock on the Sirmúr side of the Jumna, and this together with the fact that the Máharája has a certain length of river frontage along the Tons and Jumna has induced him to claim one-third the river dues which are collected at Dákhpatthar. In G. O. No. 629F., dated 21st November, 1887, to Commissioner of Meerut, the Local Government admit the justice of his claim but state that it is not their intention to make a profit at the boom. The Mahárájah's claim is based on the following.

(1) For drift wood not marked, which has been valued at Rs. 40 to Rs. 50 per annum.

(2) For the establishment he himself entertains for the supervision of thefts on the river, which he puts at Rs. 200 to Rs. 300.

(3) For rent for the rock at Dákhpatthar to which the boom is attached.

(4) For right of way along the banks of the Tons river in his territory.

The Lieutenant-Governor considered that these claims would be liberally met by an annual allowance of Rs. 500, or by one-third of the boom dues, whichever is the greater sum in any year.

CHAPTER V.

Formation of Ranges, Blocks and Compartments, and Valuation Survey.

106. The forests which form part of the Deota and Kotigád ranges have been divided into 46 blocks, as in the following table :—

Name of range.	Name of forest.	No. of block.	Name of block.	No. of compartment.	Area, in acres.	Area of forest, in acres
Deota ...	Deota ...	I.	Tadiár	1	576	
		II	Pártil	6	775	
		III.	Temple	5	355	
		IV.	Dopta	3	280	
		V.	Katatách	5	380	
		VI.	Jauráśi	6	564	
		VII	Kanga	5	323	
		VIII.	Patángni	5	693	
		IX.	Kimári	3	420	
		X.	Bhagiar	1	561	
						4,937
	Bamsu ...	I	Pipal	4	908	
		II.	Dhikuri	3	701	
		III.	Bamsu	4	714	
						2,323
	Sarás ...	I.	Damráli	5	884	
		II.	Kanda	2	350	
						1,234
	Sáhlra ...	I.	Moriru	4	1,645	
		II	Kangagád	6	1,315	
		III.	Deotal „	4	1,310	
		IV.	Kuni „	4	1,545	
		V.	Dwanti „	3	990	
		VI.	Sill „	3	805	
		VII.	Jodar „	6	1,800	
						9,410
	Noránu ...		Noránu	5	1,520	1,520

Name of range.	Name of forest.	No. of block.	Name of block.	No. of compartment.	Area, in acres.	Area of forest, in acres.
	Naintwár ...		Naintwár	7	...	3,450
	Dátmir ...		Dátmir	7	...	2,560
Kotigád ...	Lambatách,	I.	Inádi	...	321	
		II.	Lohán ...	...	275	
		III.	Chakora ...	...	291	
		IV.	Garasna ..	...	320	
		V.	Banárpani ..	...	227	
		VI.	Namitách ...	...	167	
		VII	Ghoria ...	...	385	
		VIII.	Dhamti ...	...	346	
		IX	Thanwora ..	...	519	
		X.	Kandar ...	...	42	
						2,883
	Kotigád ...	I.	Bálcha ...	2	480	
		II.	Murali ...	6	1,044	
		III	Ola ..	7	2,444	
		IV	Gokal ...	4	1,108	
						5,076
	Chánsil ...	I.	Duchánu ...	...	260	
		II.	Jagta ..	2	540	
		III.	Dedragád	10	2,355	
		IV.	Andrigád	4	1,885	
		V.	Boktaragád	4	1,575	
		VI.	Tara Mundal	5	4,290	
		VII	Maunda ..	3	900	11,805
			Total ...	...	...	45,198

107. *Blocks.*—The Lambatách forest was divided into blocks and the Deota, Bamsu, Sarás and Kotigád forests into blocks and compartments by my predecessors Mr. Rind, I believe, doing most of the work. It would perhaps have been best to have given serial numbers to all the blocks and to divide the circle in a somewhat different manner, but as maps of the Lambatách and Deota forests had already been printed showing all the blocks and compartments, it was thought better not to make any alteration but to use the same system in the division of the remaining forests.

108. *Compartments.*—Regarding each of the Lambatách blocks as a compartment, there are in all 165 of these divisions varying in size from 31 to 2,800 acres, but usually between 100 and 300 acres the very large ones containing an area stocked with oaks and firs, which it would be purposeless to further divide. The compartments in the Deota forests have had pillars erected around their boundaries and are, as a rule, smaller than the ones formed by me in the newly-demarcated areas where I tried as much as possible too avoid too minute a sub-division. The manner in which they have been formed can be seen from the maps and from the description of their contents, and here it need only be said that the deodár zone has been separated as much as possible from the karshu and chír zones.

Valuation survey.—Lambatách forest having been worked out, no valuation of its contents has been made. Most of the Deota forest was valued by Mr. Rind in 1877-79. Its valuation was completed by Mr. Lowrie in 1879-80, when he also valued the Bamsu forest and part of the Kotigád forest, finishing its valuation as well as that of the Saras forest in 1880-81.

The mode in which this valuation was made is described by Mr. Rind as follows, (but it was not correct to take the mean girth, the number of trees, as may be seen from the results of the enumeration, steadily diminishing as they increase in girth. Thus for trees 3-6 feet in girth, 4 feet; for trees from 6-9 feet in girth, 7 feet; for trees from 9-12 feet in girth, 10 feet would represent the average.)

For purposes of enumeration and measurement the first and second class trees were arranged as follows ;—

Limits of girth and height of the class s.		*Mean.*		Remarks.
Girth.	Height.	Girth.	Height.	
Ft.	Ft.	Ft. in.	Ft.	
3—6	various. ...	4 6	various ...	Second class trees.
6—9	under 30	7—6	20	First class trees.
6—9	30—50	7—6	40	
6—9	50—70	7—6	60	
6—9	over 70	7—6	80	
9-12	under 30	10—6	20	
9-12	30 50	10 6	40	
9-12	50—70	10—6	60	
9-12	over 70	10—6	80	
over 12	under 30	14-0	20	
over 12	30-50	14-0	40	
over 12	50—70	14—0	60	
over 12	over 70	14—0	80	

The girths are at four feet from the ground. The heights refer to the length of marketable stem, such as will yield logs for 10 feet sleepers, and not to the total height of the tree. The system of enumeration by tickets was adopted as follows :—

Four colors were selected for the girth classes, *viz*, class I white, class II green, class III red, and class IV blue. The height classes were denoted as follows on these tickets: the lowest height class by a plain ticket, and the remaining three height classes by the Nos 1, 2 and 3, respectively, printed on the tickets. Round tissue paper tickets two inches in diameter, prepared as above, were procured from Roorkee, and fastened up in bundles of 100 each. The plan pursued in valuing a forest by the ticket system is as follows, the officer in charge organising each party thus :—

A forester in charge of three sub-parties, each of the following strength :—

1 Forest guard.
2 Gaugers.
3 Height measurers and ticketers.

To the forester he makes over a certain number of tickets very carefully counted, also the gauges, the bamboos, the paste pots and bags (in which there are 13 pockets for the tickets, and which are slung over the gaugers' backs). Each sub-party passes through the forest in a line of pairs, each pair consisting of a gauger and height measurer, the forest guard directing them. The diameter of each tree is measured with a gauge, and at the same time its height is estimated by the aid of a 20 feet bamboo placed against the trunk. On each tree so measured a ticket of the color and number representing its girth and height class is affixed on a blaze cut to receive it. The forest guards are responsible for the quantity of work done. The forester keeps a journal showing the daily work of his sub-parties, notes the issues and receipts of tickets, and exercises constant supervision by moving about in the forest, watching the work, taking check girths and heights in the completed portions, and recording the same in his diary. The check by the officer in charge consists in his periodically visiting the work, testing it on lines through each compartment if he suspects inaccuracy, and by occasionally resurveying a whole compartment.

Mr. Brandis considered the classification needlessly elaborate, and considered it sufficient to count the deodar trees of two classes above six feet in girth and between three and six feet in girth, whilst the average length of the first class trees and the number of sleepers they will yield can readily be estimated for each compartment. The valuation of the remaining forests was undertaken by myself at the time I demarcated them in 1885 under the terms of the new lease. The same system (Mr. Dansey's) in making the enumeration was adopted as that employed in the Nindhaur valley and in the Ganges Division, and which is explained in the working plans for those forests.

110 The results of the valuation survey for the whole of the forests are given in Appendices D and E, the number of deodár actually counted being—

Name of forest.	I class 6′ in girth and over	3′—6′ in girth.	Total.	Remarks.
Lambatách	Not valued.		-	
Deota	28 738	33,782	62 520	
Bamsu	15,447	12,572	28,019	
Sarás	7,4 6	4 439	11,854	Includes Dumráli 5 valued in 1885
Kotigád (Bálcha, Ola and Murali blocks.)	6,667	3,734	10,401	
Total for forests valued by Messrs Rind and Lowrie	58,268	54,127	1,12,795	

	I class over 24″ in diameter				II Class 18″—24″ in diameter	III Class 12″—18″ in diameter.	IV Class 6″—12″ in diameter.	Total.
	Green		Dry sound.					
	Sound.	Unsound	Erect	Fallen.				
Kotigad (Gokal block)	7,007	71	386	372	1,916	2,660	6,799	19,211
Chánsil ...	19,985	335	1 010	1,056	7,172	8,987	19,957	58,502
Sábtra ...	26 645	698	1,619	2,276	8,840	12,262	38,822	91,,63
Noránu .	8,142	142	4 10	443	2,675	3,686	8,292	23,810
Nainutwár ...	10,459	223	439	396	4 240	5,193	10,916	31,866
Látmir ...	4 871	117	168	126	1 775	2,433	3,934	18,424
Total for forests valued in 1885.	77,109	1,586	4,052	4,669	26,618	35,221	88,720	2,37,975

In the first forests every tree was counted, but in the others trees growing on precipitous unworkable ground were omitted.

CHAPTER VI.

YIELD OF THE FORESTS.

111. *Rate of growth.*—The following table gives the results of the annual ring-countings made in these forests by officers in charge of the works, the countings in the Andrigád having been made by a forest student :—

Name of block.	No. of trees counted	Average number of rings.													Remarks
		0″ to 2″	2″ to 4″	4″ to 6″	6″ to 8″	8″ to 10″	10″ to 12″	12″ to 14″	14″ to 16′	16″ to 18″	18″ to 20″	20″ to 22″	22″ to 24″	24″ to 16″	26″ to 28″	
Dopta ..	29	22	17	18	17	19	22	20	21	24	19	...	...	..	...	An addition was made to the number of rings actually counted in the first two inches to allow for the early growth of the trees, but it was unfortunately not stated how much was added
Temple ..	15	26	18	18	18	17	19	20	21	18	33	20	23	...	...	
Katatach,	52	27	23	23	21	22	23	24	22	25	27	23	...	...	..	
Jaurási ..	35	27	18	19	19	21	21	23	25	27	25	22	30	36	40	
Andrigád,	50	26	22	21	22	21	20	23	23	26	26	27	29	37	40	
Average for the five blocks.		26	20	20	19	20	21	22	22	24	26	23	27	36	40	

In the Andrigád under my direction the thickness of the sapwood and of the bark was also measured, and the average thickness was :

Sapwood	1 87 inches.
Bark	·50 ,,

Neglecting the thickness of the bark in the case of the youngest class, where it is very thin, taking it as ·25 of an inch in the next, and as ·50 in the two highest classes, we find that the average number of years a deodár remains in one diameter class is as follows :—

V Class.	IV Class.	III Class.	II Class	I Class. (part of)	I Class. (part of)	I Class. (part of)
0″—6″	6″—12″	12″—18″—	18″—24″	24″—30″	30″—36″	36″—42″
36	28	26	30	32	35	38

112. That the deodár in these forests are capable of attaining large dimensions is clear from the enumeration made in the Deota forest given below, which shows that one-third of the first class trees are over 9 feet in girth, whilst 1 in 17 are over 12 feet in girth.

Girth class.	Average height of marketable stem	Number.
3′—6′	Various.	33,782
	Feet.	
6′—9′	20	1,276
	40	11,127
	60	7,548
	80	1,366
		21,317
9′—12′	20	151
	40	941
	60	2,456
	80	2,187
		5,735
Over 12	20	32
	40	111
	60	383
	80	1,070
		1,596

Most of the trees are sound, and in the forests recently valued the unsound trees did not amount to 2 per cent. of the total number of I class trees. In the Dopta block of the Deota forest, however, which is rocky and precipitous, many trees from 32 to 38 inches in diameter were found to be hollow in the centre, whilst in the adjoining Temple block where the soil is deep and good, trees of 40 inches in diameter and 250 years old were quite sound.

113 It is evident from the above figures that the deodár is here capable of reaching a girth of at least from 6 to 9 feet and the question is at what size do they reach their maximum of utility. This must be considered solely from the outturn of sleepers which is at present almost the only marketable commodity. Experiments have been made at Deota to determine this outturn per tree, sample trees being chosen to represent different girths and the best sawyers being employed to saw them up, the rate of pay being higher and greater care taken than with ordinary trees. Particulars of these measurements are given in Appendix I, but they are somewhat discordant and the form in which the results are shown having been changed almost every year, it is very difficult to make any useful deductions and owing to want of supervision the figures are not very reliable. From this table, however, we gather that the outturn in good metre guage sleepers of trées of the following girths are : —

	No of sleepers
Girth 6′	38
„ 7′	52
„ 8′	70
„ 9′	96

The two six-feet sample trees felled in Dopta yielded only 16 sleepers, however, and making allowance for this exceptionally low figure, a more accurate estimate of the outturn would be :—

Girth in feet.	Average age of tree in years.	Number of sleepers.	Annual yield in sleepers
	about.		
6	120	40	·33
7	140	50	·36
8	165	70	·42
9	185	95	·51

This favorable result for the larger trees is to a certain extent counterbalanced by the number to the acre diminishing with the size of the trees, but it would appear advisable to restrict our fellings to trees of from 7 to 8 feet in girth and over, were it not that many trees six feet in girth on rocky precipitous ground have probably almost ceased growing and that these forests have to be opened out for the first time and expensive export works undertaken. It is therefore proposed to fix a diameter of two feet as the size below which no healthy trees are to be felled and with the understanding that exceptionally vigorous well-grown trees which are barely over two feet in diameter shall be spared.

114. The real outturn per tree in the fellings which have taken place at Deota will be seen from the following figures :—

	Number of sleepers per tree.
1881-82	60
1882-83	63
1883-84	64
1884-85	35·5
1885-86	34 7
1886-87	43 2
Average ...	·50

The falling off of is very noticeable. It is attributed to the inferior size and quality of the trees now being felled, to greater strictness in excluding sapwood from all sleepers prepared, and perhaps to the rocky nature of the fellings and consequent breakages. It was found that the percentage of breakages was greater when trees were felled by the saw than when felled by the axe, and Mr. Moir considers the former method unsuitable on steep ground as it is more difficult to direct the fall of the tree than when the axe is used. In 1883-84 when the outturn was 64 per sleeper, fellings were made in Katatách 3 and 4 and in Jaurási 3 and 4, compartments not so superior to Jaurási 4, 5 and 6, where fellings have lately taken place, as to justify the great diminution in the outturn which is more likely due to the marking of a number of undersized trees, but no particulars can be obtained on this point. Confining our fellings as it is proposed to do to trees over two feet in diameter the yield per tree may be placed at 50 metre gauge sleepers as the average for the whole of the forests, inclusive of sleepers obtained from dry wood.

115. Only from 25 to 50 per cent of the cubic contents of a deodar tree is utilisable in the shape of sleepers, and the remainder consisting of slabs, logs shorter than 6½ feet and logs of that size slightly unsound have to be left in the forest for lack of a market. The presence of such large quantities of refuse wood renders fire protection more dangerous and is a great hindrance to reproduction, but as yet it has not been found possible either to get rid of this wood or to utilise it profitably.

116. Omitting such forests as have been worked over with the exception of certain blocks in Deota which are to be reworked, the following were the number of 1st class trees in 1885 :—

Forest.	Sound and unsound		Dry standing and fallen.	Estimate of sound green trees available	Remarks.
Deota (Kánga, Patángni and Kimari) ...	10,943		...	6,878	Of these trees 2,878 were felled from 1885-86.
Ban su	15,447		...	6,000	
Saras	7,416		...	3,000	
Kotigád except Gokal	6,667		...	2,500	
	Sound	*Unsound.*			
Kotigád (Gokal block)	7,007	71	...	2,500	
Chánsil	19,985	335	2,066	6,000	2,000 to be worked out.
Sáhlra	26,645	698	3,895	11,000	
Novánu	8,142	142	873	3,000	
Naintwár	10,459	223	835	4,000	
Portions of Deota to be reworked, Pártil, Temple, Dopta, Katatách, and Jaurasi blocks.	...	...	...	4,000	
Total ...	...	...	...	46,878	

We can thus fell 2,000 green trees over two feet in diameter yearly during the term of the lease, and these together with the dry standing and fallen trees should furnish annually one lakh of metre guage sleepers, whilst 12,000 trees in the more inaccessible forests remain in reserve.

CHAPTER VII.—THE WORKING PLAN.

117. *Fellings.*—This plan should really be considered as beginning from the 1st of April, 1885, the date of the renewal of the lease of the forests for a further term of 20 years, and all records should be properly kept up from that date.

118. In 1885-87 the following trees were felled :—

		Green trees.	Dry trees.	Total.
1885-86	Jaurási 4, 5 and 6	874	87	961
1886-87	Jaurasi 5 and 6 (small part of) ...	810	91	901
	Kánga 1 and 2 (ditto) ...	90	30	120
	Kánga 4	101	27	128
	Total ..	1,875	235	2,110

For the present year's work (1887-88) the following trees have been marked :—

	Green trees.	Dry trees.	Total.
Kánga 1	609	117	726
" 2	340	77	417
" 3	54	8	62
Total ...	1,003	202	1,205

About 8,000 metre gauge sleepers will also be cut up from fallen trees in the Dodragád block.

The figures for each compartment are estimated as the records have been kept for blocks only since 1885-86, and they cannot therefore be relied upon. For instance, about 400 trees would appear to have been felled in Kánga 2, whereas only 182 first class trees were counted at the time of the valuation survey ; it is regrettable that a change should have been made in keeping the returns just prior to the preparation of the working plan.

119. In future it is proposed to fell departmentally 2,000 green trees over 8 feet in girth annually, and in addition to utilise all dry standing or fallen trees in the compartments worked over, such fellings yielding it is anticipated about 100,000 metre gauge sleepers each year. The arguments in favor of this proposal are that the forests having to be opened out for the first time and costly export works having to be constructed, the undertaking can only prove remunerative if conducted on large scale, whilst it is important to utilise the slides, sledge roads, &c., to the fullest extent possible. Taking into consideration the length of the working season, the time required for sledging, sliding, &c., it is believed that as regards the majority of the forests a lakh of sleepers is the maximum that can be worked out in a year from one base of operations and a single system of export works. The inadvisability of having continuous departmental works in two places is proved by the situation and state of the forests it is intended to leave in reserve.

The order to be observed in the selection fellings is detailed below, but it is not desirable to prescribe a rigid adherence to this programme, as it is possible the yield of certain blocks may be either under or overestimated; if, however, after some years it is found that the forests are being worked through more rapidly than provided for by this scheme, the reserve of 12,000 trees can be indented upon. Thus it is quite

possible that the quantity of timber still remaining in Deota is less than anticipated, and that the forest may be worked out in three years instead of four.

Year of selection felling.	Name of blocks and compartments to be worked over.
1888-89 ...	Kánga (remainder of), Patángni 1 and 2.
1889-90 ...	Patangni (remainder of) and Kimáti.
1890-91 ... } 1891-92 ... }	Pártil, Temple, D pta, Katatách and Jaurási (to be reworked).
1892-93 ...	Bamsurgád Dhikuri 1.
1893-94 ...	Dhikuri 2 and 3.
1894-95 ...	Pipal.
1895-96 ...	Kánda and Damráli 1 and 3.
1896-97 ...	Damráli 2, 4, and 5 and Morirn.
1897-98 ...	Kángagád, Deotalgád and Kunigád 1 and 4.
1898-99 ...	Kunigád 2 and 3, and Dwántigád 1 and 3.
1899-1900 ...	Dwántigád 2, and Siligád 1 and 3.
1900-01 ...	Siligád 2 and Jodárgád 1.
1901-02 ...	Jodárgád (remainder of).
1902-03 ...	Naintwar 4, 5 and 6.
1903-04 ...	Naintwár (remainder of).
1904-05 ...	Andrigád and Boktáragád.

The trees in Kánga and Patángni being, however, somewhat below the average size, it is probable that the yield will not amount to one lakh of metre gauge sleepers during the first two or three years, but the deficiency can be made up from dry wood in the Dháragád forest, which it is intended to work out immediately.

120. If these proposals are sanctioned, the forests remaining in reserve will be—

	No. of trees available.
Kotigád (Bálchá, Murá.i and Ola blocks)	2,500
Ditto (Gokal block)	2,500
Chánsil (part of)	4,000
Noránu	3,000
Total ...	12,000

In the Kotigád forest the trees available are scattered over a very large area and are situated for the most part at a considerable distance from a floatable stream, the Gokal block being at the head of the Bannáli gád many miles from its junction with the Kotigád, at which point only could the sleepers be floated to the Pábar. The present price of sleepers scarcely warrants making expensive export works for bringing out the small quantity of timber available. The Chánsil forest has already been partially worked, and when the two thousand additional trees which it is proposed to fell in the Andri and Boktára gáds have been extracted, all the finest trees in this forest will have disappeared. Lastly the Noránu forest is situated above a line of precipices, much of the forest itself being very precipitous, so that it is by no means certain that sleepers can be profitably exported; at present, therefore, it seems unnecessary to draw up a regular scheme for working these forests, whilst it is very useful to have a reserve to fall back on in case of need. If, however, during the course of the lease, there happens to be a pressing demand for a larger outturn of sleepers and the working scheme for the other forests is progressing according to the programme, the reserve forests can be indented on for the extra supply, or standing trees can be sold from them to contractors, provided that such a course in no way interfered with the sleepers worked out departmentally. Thus if the department is bringing out narrow gauge sleepers it might be stipulated that the purchaser of standing deodár should export his timber in the form of broad gauge sleepers or of scantling of various dimensions.

121. *Protection from fire and grazing.*—All the forests being already fire-protected, there is nothing to prescribe under this head. As to grazing it is not contemplated at present to close any further areas, as the forests are mostly remote from villages, and the grazing is therefore very light, the most valued portions of the forests for this

purpose, being, moreover, the zone of karshu and firs above the deodár which is at present otherwise valueless. The forest officer should, however, have no difficulty in closing any compartments where, hereafter, cultural considerations show such a course to be necessary.

122. *Plantations*—As the larger part of these forests has only been fire-protected since 1885, the result of such protection must be awaited before it can be determined what areas it will be necessary to plant up artificially ; but judging from the results of fire-protection in the Deota and Lambatách forests, it is hoped that it will be unnecessary to resort to planting operations on a large scale. There are, however, certain areas in the forests which have been protected for ten years or more, where it is hopeless to expect a natural crop of deodár seedlings owing either to the absence of seed-bearers or to other causes. It is, therefore, proposed to plant up the following areas during the period of this working plan according to the scheme given below, endeavours being made to plant or sow up as nearly as possible 40 acres yearly with deodár in lines of pits 6′ × 6′ but this will, of course, depend on the quantity of seed available.

Name of block.	Number of compartment.	Approximate date of planting.	Approximate area to be planted.	Remarks.
Lambatách forest				
Lohásu	...	1889	40	Under kail near the Lohasu dhar.
Chakora	...	1890	50	In the part where firs have been rung.
Banarpáni	...	1891	50	Ditto ditto.
Kotigád forest.				
Murali	5	1892-95	150	On open slopes containing young kail.
Ola	4	1897	50	Ditto ditto.
"	5	1898-1902	200	Ditto and under the open ban and kail forest.
"	6	1903-05	100	Ditto ditto.
Bamsu forest.				
Pipal	4	1896	50	On grassy slopes and deserted terraces near the Bamsu hut, kail to be sown first in 1889 or 1890.
Total ...	...	...	600	

In addition to this the deodár plants, from 30,000 to 40,000 in number, now in a nursery at Deota will have to be used for planting up the area rung in the Temple block, whilst any that remain can be put out in Pártil. Planting will also have to be resorted to, to fill up blanks throughout the Pártil, Temple, Dopta, Katatách and Jaurási blocks after the prescribed fellings have been completed, but it is impossible to estimate here the number of plants required for this purpose. Every year that seed is procurable nurseries capable of containing about 50,000 seedlings should be prepared and sown up.

The 500 acres which it is proposed to stock with deodár in the Kotigád forest are most favorably situated for the purpose, and the planting operations should prove a great success The aspect is more or less northerly, the ground steepish but not rocky or precipitous, whilst the young kail and ferns will afford a most welcome shelter to the young deodár. The pits can first be sown up and nurseries established close at hand to supply plants for filling up failures. In the Chakora and Banárpáni blocks strong healthy three-year old plants should be used and the pits will have to be most carefully drained. Pipal 4 is the only compartment where it will be necessary to sow young kail before planting deodár. During the dry season the seedlings will have to be carefully protected from the sun by grass cowls in places where they do not get sufficient shelter from young kail or other plants, special care being taken on warm southerly aspects.

There are other areas which might be taken in hand such as Dhámti, but this is a most difficult block to restock (*vide* paragraph 72), and it is considered inadvisable to risk failure on such a troublesome undertaking when there are extensive slopes, much more favorably situated, which require planting up. It is believed that 40 acres per annum together with the other planting operations in Deota and the maintenance of the existing plantations will be as much work as can be carried out; at Dhámti therefore only the old plantations should be kept up, all blank pits being resown.

As the artificial cultivation of deod r is now fairly well understood in this division, it is unnecessary to expatiate here on the methods to be used in sowing and planting.

123. *Cultural operations prior to the fellings.*—With the fact before us that deodar is the only tree of any value in these forests, the importance of aiding it in its struggle for existence with its neighbours is self-evident. Probably the best and cheapest means of rendering this assistance is by a continuance of the operations described in paragraphs 75 and 76, only doing so according to a regular plan instead of here and there in a desultory kind of way as has hitherto been the case. The scheme given below has been so arranged that the thinnings shall precede the selection fellings usually by five years. The operations to be carried out are those detailed by Mr. Fernandez in paragraph 80 of his working plan for the Mundáli forest in this division, and which it would be superfluous to repeat here. It will, however, probably not be feasible to carry out completely his rule No. IV over such large areas, but every endeavour should be made to adhere as closely as possible to the three first rules. The areas to be worked over annually may appear excessive, but it should be recollected that a portion only of each block will really require thinning, although owing to the absence of maps it is impossible to indicate even approximately the acreage which will have to be gone over each year, but taking into account blanks and other causes it will not probably amount to more than one-third of the deodar producing area.

Date of thinning	Name of block.	Deodár producing area.	Remarks.
		Acres.	
1888-89 ...	Bamau and Dhikuri	1,192	
1889-90 ...	Lipal	708	
1890 91	Sarás	1,000	
1891-92 ...	Morira	1,395	
1892-93 ...	Kánragád	675	
1893 94 ..	Deotalgád	790	
1894 95 ...	Kuni gád	1,245	
1895-96 ..	Dwantigád	990	
1896 97 ...	Siligád	805	
1897 98 ..	Jodárgád	1,600	
1898-99 ..	Naintwar	2 450	
1899-1900 ...	Andri and Boktára gáds	2,000	
1900-01 ...	Gokal and Bálcha	1,445	
1901 02 ...	Tára Mundal and Maunda ...	1,445	
1902-03 ...	Dedragád, Duchánu and Jágta ...	2,655	Probably no thinnings will be required in Duchánu and Jágta.
1903 04 ...	Muráli	692	
1904 05 ...	Ola	1,35[illegible]	
	Total ...	22,437	

124. *Cultural operations after the fellings.*—It is only reasonable to expect that, with the help of fire-protection, the cultural operations prescribed in the preceding paragraph and the opening out of the forest by the selection fellings, numerous seedlings will be produced.

In order, therefore, to assist these seedlings in establishing themselves and to give more light to the advanced growth, it is necessary to resort once more to thinning and cleaning. It is proposed, accordingly, to make these thinnings about the

fifth year after selection fellings have passed through the forest, following as closely as possible the accompanying scheme :—

Date of thinning.	Name of block.	Deodár producing area.	Remarks.
		Acres.	
1888-89 ...	Pártil (also Patángni 3) ...	530	The areas of Patángni 2 and Kimáti 3 are not included, as about an equal area in Partil and Temple has already been thinned.
18-9-90 ...	Temple (also Kimari 2) ...	305	
1890-91 ...	Dopta	156	
1891-92 ...	Katatach	250	
1892-93 ...	Jaurási	350	
1893-94 ...	Kánga	223	
1894-95 ...	Patángni	453	
1895 96 ...	Kimári	193	
1896-97 ...	Bamsu	} 1,192	
1897-98 ...	Dhikuri		
1898-99 ...	Pipal	708	
1899-1900 ...	Sarás	1,000	
1900 01 ...	Moriru	1,395	
1901 02 ...	Kángagád	775	
1902-03 ...	Leotalgá i	790	
1903 04 ...	Kunigad	1,245	
1904-05 ...	Dwantigád	990	
	Total ...	10,455	

The principles on which this operation should be conducted are explained in paragraph 105 of the Mundáli working plan but the thinning should be more severe than as laid down in the paragraph referred to, since the young deodár can stand any quantity of light, provided it receives a certain amount of lateral protection, whilst owing to the extensive area to be treated, it is out of question to go over the same ground at very short intervals. As ringing operations have already been made over a considerable portion of the Deota forest, the thinnings prescribed above will probably not require repetition before the end of the lease. In the Lambatách forest, the progress of the young deodár under the advanced growth of kail will have to be carefully watched, and if necessary further cleanings will have to be made, but it is not anticipated that much more assistance will be required.

The ranger with all the sleeper works on his hands, will have but little time to attend to these cultural operations, and in order that they may be properly carried out, it is suggested to engage five parties similar to those employed on enumeration surveys, and if possible the same men. Each party would consist of seven khalasis and one jamadár and would have to work for two or three months in the year, (April, May, and June). The divisional officer and the ranger can instruct the jamadárs, who are intelligent men, in the mode of conducting these operations, and after a little guidance they will doubtless do the work required of them in a very satisfactory manner.

125. *Export Works.*—It is not intended to give here carefully prepared plans of the export and other works which will be required to carry out this working plan, but only to offer some general hints on the subject. The reasons for this may be briefly stated.

(1) To prepare plans and estimates of all the works required for opening out the forests, the working plans officer would require at least a whole working season and the publication of the present plan would be greatly delayed.

(2) The nature of the works depends to a great extent on the demand for timber of definite dimensions, so that if, for instance, as has been mooted, the Rajputana Railway system were to be converted from the narrow to the broad gauge, most of the plans and estimates would become useless.

(3) It is to be hoped that improvements in the methods of hill transport will continue to develop, so that by postponing the preparation of plans and estimates until the works are actually required, full advantage can be taken of all new ideas.

126. Under these circumstances it will be best that proposals for constructing export works such as roads, slides, sledge roads and so forth be drawn up for each

separate export basin two years previous to the beginning of felling operations. Four different schemes will thus have to be prepared approximately at the following dates.

1889-90	For Bamsu and Sarás.
1894-95	„ Sáhira
1899-1900	„ Naintwár.
1901-02	„ Andi gad and Boktara gád.

These schemes being thus ready two years in advance, many export works such as the construction of roads, making streams floatable, &c., can be put in hand as soon as sanctioned, thus avoiding delay and interruption when passing from one export basin to another. In drawing up these schemes the system of transport to be used must, of course, depend almost entirely on the relative cheapness of the transport employed compared with the expenditure to be incurred. To enable a comparison to be drawn between the different systems at present in use, the following rates per sleeper per mile show the actual cost of exporting metre gauge sleepers from the Deota forest.

On coolies' backs	9 pies.
By sledge road	2¼
By wet slide	1 for two miles two pies only.
Floating down the Tons	$\frac{1}{16}$

The cost per mile does not vary much whatever the length of the export lines if over one mile long, except in the case of the sliding and floating, where the longer the line the less the cost.

The capital expenditure per mile on the three first systems may be estimated roughly at—

		Rs.
Export road	...	30
Sledge road	...	4,500.
Wet slide	...	7,000.

From these figures it will be seen that, in order to recover the cost, about 1½ lakhs of sleepers would have to pass over the sledge road and about two lakhs would have to pass down the slide, so that it would not pay to make such export works for a smaller number of sleepers. In the case where either a wet slide or a sledge road could be made, taking the same figures, we find that the former, if only one mile long, would not be so remunerative as the latter unless 6½ lakhs of sleepers could be passed down it, whereas if the length were two miles it would pay better than a sledge road with an export of 4 lakhs, and for a length of three miles with an export of 3½ lakhs only.

The nature of the export works that will probably be required may be now briefly pointed out.

127. *Deota.*—The sledge road is new and in good order, so that only slight repairs will be required. The wet slide, on the contrary, is old and very leaky, and extensive repairs will have to be made. The largest number of sleepers hitherto brought down in one season has been about 50,000 only, and in order to export double that quantity it will be necessary to stop the great leakage of the slide, rendering it more watertight by caulking the seams with tow or sunn and tar or sál resin (rál) and by making a few dams in the bed of the stream, in order to bring more water into use so as to prolong the floating season; it may also be necessary to work at night. If this does not suffice the slide will have to be doubled. It is perhaps possible to make tar on the spot, and this should be tried.

128. *Bamsu and Sarás.*—In June, 1885, Mr. Moir inspected the Bamsu gád with the object of ascertaining whether it would be possible to construct a slide for the export of timber from these forests. The annexed sketch map (tracing No. 6) accompanied his report, which may be summarised thus. "It is to be hoped that some system of wire tramway will be invented in order to get the timber past the waterfall and precipice which blocks the way about two miles from the Tons. Owing to the distance of the lower portion of the slide from the Bamsu forest, it will be out of the question to use deodár for the construction of the slide on account of the cost of carriage, so that chír timber will have to be employed, but the main beams of the bridges and 'secunjas' or block sleepers can be made of hill toon and other woods which are available in the gád. The construction of the proposed slide from the Tons as far as

the precipice will present no difficulty, as there is only one small waterfall, and the average gradient is not more than 5 or 6 degrees. For the upper portion of the gád above the waterfall the ground is practicable for either a slide or a sledge road, but the former is, of course, preferable, since ample water power is available, and timber for this portion can be obtained from the demarcated area."

From the felling scheme it will be observed that about 4½ lakhs of sleepers are expected to come from the two forests, so that a slide from the foot of the waterfall to the Tons should prove a remunerative work. From the Bamsu forest above three lakhs of sleepers should be brought out, and a sledge road from the forest to the head of the waterfall would pay better than a slide, unless the latter could be constructed for less money than estimated in paragraph 126. From the Sarás forest 1½ lakhs of sleepers are expected, an da sledge road would therefore only just pay its way; so that unless it can be made very cheaply it would be better to employ coolies to bring the sleepers to the slide.

129. *Sáhlra.*—This forest is situated at about a mean distance of 7 miles from the Tons, and the export would be down the Kuni gád, which the neighbouring villagers say is floatable during the rains below the forest boundary for a distance of about 5 miles; but this stream has not been examined during that season, and the distance to the Tons is estimated only. If not, however, at present floatable, it can probably be easily rendered so, at least in the lower part of its course. Slides could be made down all the main tributaries, but it would not probably pay to make any even in the Kuni, Sili or Jodar gáds, as only one or one and a-half lakhs of sleepers would come from each basin; sleepers from the Kuni, Dwánti and Sili gáds would all have to be brought to a point just above the line of precipices, and it is possible that at this point it might be worth while to construct a dry slide or a wire tramway to carry them down to the wet slide below. The works, however, which will almost certainly have to be undertaken, will be a wet slide from the foot of the precipice to the point from which it is possible to make the Kuni gád floatable, and from this point to the Tons, works in the bed of the stream to facilitate floating the sleepers. It is expected that 5½ lakhs of sleepers will come from this forest.

130. *Naintwár.*—This forest is situated directly over the Tons at a mean distance of less than three miles from the river. There are two separate export basins, *viz*, the Mairi and Koarbo gáds, and owing to the small number of sleepers, two lakhs from the whole forest, it is probable that special export works would prove unremunerative, and that coolie labor will have to be relied on for bringing the sleepers to the river.

131. *Kotigád.*—Both the Andri and Boktara gáds flow into the Koti gád, which is floatable below its junction with the Andri gád, but sleepers often take as long as three or four months before they reach the Pábar, which is only distant about 11 miles, and it would therefore seem advisable to spend some money in improving the bed of the stream by removing the chief obstacles.

The Gokal block of this forest is about three miles from the Koti gád, the line of export being down the Bannáli gád. If a slide were made from the Muráli gád to the main stream, a distance of about 1¾ miles, it would tap this block as well as Bálcha and Muráli. It is doubtful, however, considering the quantity of timber available, whether such a slide would pay; but as the forest is to be kept in reserve, the question is not an important one for the present. Sleepers from the Ola block would have to be carried direct to the Koti gád, the mean length of carriage being a little over 3 miles.

132. *Noránu and Dátmir.*—The Kanoni gád, which runs through the Noránu forest, reaches the Rupin just above its junction with the Tons, after a course of about three miles; but owing to the small quantity of mature timber, it would not probably be worth while making a slide, although its construction is perfectly feasible. Bringing the sleepers past the line of precipitous ground will, however, be a very difficult undertaking; and if only some workable kind of wire tramway could be devised, this would be the very place to try it in. It is not, however, proposed to work this forest during the present lease.

Dátmir being on the Tons itself, no expensive export works will be required even if it is determined to make any fellings here during the next 17 years. There are, however, few good trees at present available, and no fellings are provided for in the plan.

133. *Communications and buildings.*—The roads, bridges, and buildings enumerated in paragraphs 80-85 will have to be kept in repair, except the sleeper-carrying paths in the blocks which have been worked out, and the Maindrót suspension bridge and bungalow which are no longer required. A year before the selection fellings in the Deota forest are brought to a conclusion, it will be useful to make a good bridle path to Bamsu by widening the present path from Deota, and a similar path will have to be made later on from Deota to Sáhlra along the main ridge, a short one joining it from Bamsu. Roads passable for pack animals carrying food for the sawyers and coolies must also be made along the right bank of the Tons from Tadfár, passing by the mouth of the Bamsu gád to that of the Kuni gád down which will come all timber from the Sáhlra forest; whilst branches will have to be made up the two gáds referred to, and also one from Naintwár bridge to Koarbo, the road on the left bank of the Tons as far as that bridge being widened and improved.

Forest rest-houses and servants' quarters will have to be built at the camping-ground in the Sáhlra forest and at the mouth of the Kuni gád, whilst the Bamsu hut must be enlarged and improved. Houses for the forest ranger and chaukis for forest guards will be required at Bamsu, Sáhlra, Kuni gád, and Naintwár; godowns for the food-supply will also have to be built at Bamsu, Sáhlra, and Naintwár.

134. The artificial boundaries of the newly-demarcated forests should be clearly defined by a cut path two feet wide as in the case of the Deota forests. It is estimated that forty miles of paths will be required, and this might be carried out at the rate of from five to ten miles yearly.

CHAPTER VIII.

Financial results expected.

134. Plans and estimates for the various export works which will have to be made, not having been prepared, it is only possible to give here a very rough idea of the profit anticipated from the working of the forests. Moreover, the cost of exporting the sleepers will necessarily vary for each compartment and will in a great measure depend on the nature of these works, whilst all that can be done here is to strike a rough average.

135. Under these conditions the following estimate has been drawn up:—

Budget sub-heads.				Rs.
1a.	RECEIPTS.			Rs.
	Sale of 1,581,000 metre gauge sleepers at Delhi @ Rs. 1-10 0 each ...			25,69,125
	„ 85,000 rejected ditto Dákhpatthar @ 6 annas each ...			31,87
	Losses in floating @ 2 per cent. 34,000 sleepers			Nil.
	Total receipts ...			26,01,000
Budget sub-heads.	EXPENDITURE.			
A1a.	*Ordinary works in the forest.*	Rs.	Rs.	Total.
	Felling 34,000 trees @ 8 annas each ...	17,000		
	„ 3,000 dry trees @ 4 annas each ...	750		Rs.
	Logging and sawing 1,700,000 metre gauge sleepers @ 4 annas each	4,25,000		
	Commission on above works at 5% ...	22,138		
	Export of 1,700,000 sleepers to the Tons @ 3 annas each.	3,18,750		
	Temporary establishment @ Rs. 500 per annum for 17 years.	8,500		
	Loss on food-supply Rs. 1,200 per annum ...	20,400		
	Miscellaneous charges @ Rs. 350 a year ...	5,950	8,18,488	
	EXPORT WORKS.			
	Bamsu slide 2 miles @ Rs. 7,000 per mile ...	14,000		
	„ sledge road 1½ miles @ Rs. 4,500. ...	6,750		
	„ works at the waterfall	2,000		
	Sáhlra slide 2 miles @ Rs. 7,000 per mile ...	14,000		
	Rendering the Kuni gád floatable, 5 miles @ Rs. 1,000 per mile.	5,000		
	Sahlra works from forest to head of slide ..	4,000		
	Koti gád: removing chief obstacles in the stream	3,000		
	Repairs to the above works @ Rs. 1,000 per annum for 17 years.	17,000	65,750	

	FLOATING AND RAFTING			
	Daily labor establishment, 50 men floating sleepers to Dákhpatthar for three months @ Rs 467 per month = Rs. 1,401 per annum for 17 years.	23,817		
	Stacking and examining 1,666,000 sleepers at Dákhpatthar @ 10 annas per 100.	10,413		
	Rafting 1,581,000 sleepers from Dákhpatthar @ 1-8-0 per score.	1,18,575		
	Canal dues on 1,581,000 sleepers @ 0-1-1 each,	1,07,047		
	Carting 1,581,000 sleepers at Delhi @ Re. 1 per 100.	15,810		
	Miscellaneous charges @ Rs. 300 per annum for 17 years.	5,100	2,80,762	
	Total ...	...	...	11,65,000
AV,	Rent of the forests for 17 years @ Rs. 9,000 per annum ...		...	1,53,000
AVI*b*.	Purchase of tools and furniture for 17 years @ Rs. 200 per annum.		...	3,400
AVII*a*.	Making 100 miles of export paths @ Rs. 20 per mile ...		2,000	
	Making roads 4 feet wide passable for pack animals from Tadiár to mouth of the Kuni gád, up the Bamsu and Kuni gads and from Naintwár bridge to Koarbo 21 miles @ Rs. 300 per mile.		6,300	
	Making a bridle path from Deota to Sáhlra and from Bamsu to meet the Deota Sáhlra path 15 miles @ Rs. 200 per mile.		3,000	
	Widening the existing paths from Deota to Bamsu and from Tadiár to Naintwár bridge 20 miles @ Rs. 150 per mile.		3,000	
	Repairing roads and bridges for 17 years @ Rs. 500 per annum.		8,500	
	Miscellaneous charges @ Rs. 100 per annum for 17 years...		1,700	24,500
AVII*b*.	Construction of a rest-house and servants' quarters at Sáhlra		1,500	
	Ditto ditto Kuni gád ...		1,000	
	To four houses for the forest ranger at Bamsu, Sáhlra, Kuni gád and Naintwár at Rs. 200 each.		800	
	To four chaukis for forest guards at the same places @ Rs. 80 each.		320	
	To godowns at Bamsu, Sáhlra, and Naintwár @ Rs. 300 each.		900	
	Enlarging the Bamsu rest-house ...		250	
	Annual repairs @ Rs. 500 for 17 years ...		8,500	
	Miscellaneous		730	14,000
AVIII*a*.	Making 40 miles of boundary paths two feet wide around the newly-demarcated forests @ Rs. 50 per mile.		2,000	
	Repairing pillars and clearing boundary lines for 17 years @ Rs. 150 per annum.		2,550	4,550
AVIII*b*.	Compensation for land at Gokal and Koarbo		...	30
AVIII*d*.	To sowing, planting and maintaining fully stocked 690 acres as per working plan @ Rs. 20 per acre.		13,800	
	To planting operations in the Deota forest		4,000	
	To maintenance of existing plantations		340	
	Miscellaneous charges, collecting seeds, preparing plantation signboards, &c.		260	18,400
AVIII*e*.	Clearing fire-paths @ Rs. 30 per annum for 17 years ...		510	
	Burning fire-lines @ Rs. 500 ditto ditto ...		8,500	
	One fire-guard for six months in the year for 17 years @ Rs. 7 per month.		714	
	Miscellaneous charges including rewards		341	10,065
AVIII*f*.	Cultural operations 32,892 acres @ 8 annas per acre.		16,446	
	Contingencies.		1,554	18,000
AIX*c*.	Miscellaneous items		...	1,000
	Total Expenditure A ...		...	14,11,945
BI*a b and d*. BII*a b c and d*.	Half average divisional and one-fifth average of direction charges for the five years up to 1886-87.		...	2,31,400
BI*c*.	Permanent establishment for 17 years @ Rs. 1,800 per annum.		...	30,600
BIII.	Carriage of tents and records, pay of dák runners, official postage, &c., for 17 years @ Rs. 500 per annum		...	8,500
	Total Expenditure B ...		..	2,70,500
	Grand Total A and B ...		...	16 82,445
	Surplus ...		...	9,18,555
				26,01,000

There is thus an expected surplus of a little over Rs. 54,000 per annum, or an annual profit from the deodár-producing area of over Rs. 1-13-0 per acre, and this after making a most liberal allowance for all possible expenditure; no standing trees should be sold from these forests for less than Rs. 35 each, unless perhaps from the Noránu forest, where the export is particularly difficult, or from the Gokal block, which is rather remote from a floatable stream.

136. With the aid of the above figures, it may be best to explain here why it is more profitable to carry on these works departmentally rather than to sell standing trees, as the reasons do not appear as yet to be well understood or appreciated.

The expenditure, which would not be incurred if the trees were sold to contractors, may be estimated as follows :—

		Rs.
A. I *a*.		11,65,000
A. VI *b* (half of)		1,700
A. VII *a* (construction of export paths and miscellaneous repairs) ...		4,500
B I. *a*, *b* and *d* / B. II. *a*, *b*, *c* and *d*	Two-thirds deducted from expenditure incurred with departmental working.	1,54,200
	Total	13,25,400

Deducting this amount from the total expenditure of Rs. 16,82,445, we have a balance of Rs. 3,57,045, which would represent the expenditure if departmental works were abolished. In order, therefore, to obtain a surplus of Rs. 9,18,555, we should have to sell our 34,000 trees for Rs. 12,75,600, or over Rs. 37 per tree. Hitherto the highest price obtained for standing deodár has been Rs. 11-8 0 for some trees in the Andri gád within two miles of a floatable stream, so that it is clearly out of the question to expect to realize three times that amount for trees the scantling from which would have to be carried five or six miles by means of costly export works to the Tons.

The ordinary purchasers of standing trees have not sufficient knowledge to construct such works, which are of a special character, the details of their construction forming not an unimportant part in the training of forest officers; and if they could be made by private agency it is doubtful whether any purchasers would be willing to invest so much capital in the forests. On the other hand, if these works were made departmentally, the price per tree would be much enhanced; and whilst private individuals can obtain deodár from the forests of the hill chiefs at low rates, they are not likely to offer much higher sums for the privilege of working in the Government forests. If, therefore, it is considered desirable to encourage private enterprise in this instance, it can only be done by sacrificing nearly the whole of the anticipated surplus.

DEOBAN ;
5th September, 1887.

N. HEARLE,
Deputy Conservator of Forests, Working Plans

APPENDIX A.

LEASE OF TEHRI FORESTS.

1. THE Rája Partáb Sáh of Tehri hereby places at the disposal of the British Government the deodár forests in the Tons and Pábar valleys and the Sheopuri forest within his territory, the boundaries of which are set out in the schedule annexed. No person save the said Government shall have the right to take timber out of the said forests; but any privileges hitherto enjoyed by the ryots of taking wood for building houses, for burning, for making ploughs, and generally for agricultural purposes, shall continue intact.

2. The said Government is authorised to take steps for the more complete conservation of any portion of the forests hereby placed at its disposal. The said Government may prohibit the grazing of cattle or opening of thoroughfares therein, with due regard to the existing privileges of villages which have hitherto exercised the right of grazing; and the Conservator of Forests may from time to time issue such further orders, with the approval of the Rája, as he may think proper for the more effectual protection of the trees.

3. No person shall be entitled to clear ground for building in the forests referred to in clause 2, nor shall any one be permitted to cultivate on the cleared ground in the midst of such forests.

4 The Rája shall aid to the utmost of his power in the protection of the forests and in the punishment of persons infringing the forest rules and regulations.

5. The rules and regulations laid down by the Conservator in regard to the forests, having been approved by the Rája, shall be enforced, and the Rája shall regard any infringement of those rules as an offence and shall punish the offender.

6. The Rája shall be competent to take whatever timber he may need for his personal use or for the private requirements of his family.

7. The British Government shall be entitled to make roads which may require to pass through fields containing standing crops, but shall be bound to make compensation for the loss thereby inflicted. On such compensation being paid, the Rája will not object to the construction of the road.

8. The sum of Rs. 12,000 shall be paid yearly by the British Government in fulfilment of the above recorded provisions as consideration for the lease.

9. The above recorded provisions shall hold good for twenty years from the 1st May, 1885, and on the expiry of that period the British Government shall be entitled to renew it *for a further* term; but the consideration for such subsequent lease shall be determined by mutual agreement and consent of both parties (namely, of the British Government and of the Rája of Tehri) and based upon the fair value of the timber to be annually taken out.

One copy of this agreement, after it has been signed by or on behalf of both the contracting parties, shall be deposited with the British Government and another copy shall be kept by the Rája.

The Sheopuri forest, formerly attached to the Dehra Dún Division, was restored to the Rája, and the total rent reduced to Rs. 9,000 by G. O. No $\frac{35F}{12-89}$, dated 19th January, 1887.

SCHEDULE OF BOUNDARIES OF TEHRI-GARHWÁL LEASED FORESTS ATTACHED TO THE JAUNSÁR DIVISION.

Boundary of Deota forest including Lambatách, Deota, Bamsu, Surás and Kotigád blocks.

North.—A line demarcated by pillars from a point (pillar No. 28) on the Paji dhár above the Bargat gád, passing south of village lands of Makari, to a point on the Damrari gád (pillar No. 4).

East.—A demarcated line from the last-mentioned point passing above the Jagrári, Bámsu and Deota villages to the Bhagiár stream, half a mile above its junction with the Tons (pillar No. 1).

South.—From the last-mentioned point a demarcated line running above the old Khimári and Pokhári villages to a point on the Lohasu dhár (pillar No. 11).

West.—From the last-mentioned point a demarcated line skirting the Karoli, Maingaini, Bhatar and Dhamti villages to the point on the Paji dhár (pillar No. 28).

Boundary of Dátmir forest.

North.—A demarcated line from a pillar on the main ridge between Tons and Rupin rivers to a point above Gungor village.

East.—From the latter point down the spur to a point on the bank of the Tons river.

South.—From this point along the right bank of the Tons river to a pillar about three-quarters of a mile below the bridge near Dátmir village.

West.—From the last-mentioned point up the Sundru gád to the main ridge between the Tons and Rupin.

There is also a small detached block demarcated by 10 pillars on the left bank of the Tons below Dátmir village.

Boundary of Noránu forest.

West and North.—From pillar No 1 on main ridge between Sahlra and Noránu gádhs, along the water-parting of Rupin and Tons rivers, to pillar No. 12 Pharion-daula.

East.—From pillar No. 12 by a demarcated line to pillar No. 11.

South.—From pillar No. 11 by a demarcated line above the cultivation of Noránu to pillar No. 1.

Boundaries of Naintwár forest.

West and North.—From pillar No. 18 along main dhár, separating the Rupin and Tons rivers, to pillar No. 1 on the Bala dhár.

East.—Down the Bala and Kuba Karshu dhárs to pillar No. 6.

South.—By a demarcated line above the cultivation of Koarbo to pillar No. 18.

Boundaries of Chansil forest, including Dedragád, Andrigád, Gokal and Sahlra blocks.

North.—From a pillar, No. 1, at the source of the Galtai gád along the Chansil ridge to a point above the waterfalls on the Jodar gád.

East.—From the last point along a ridge east of the Jodar gád to pillar No. 83 above the Khuni gád, thence by a demarcated line crossing the Jodar gád and above the Sahlra cultivation to pillar No. 63 on the northern boundary of the Surás block of the Deota forest.

South.—From last point along the boundary of the Surás block to pillar No. 62, and thence by a demarcated line round Gokal, Maundá and Cheo cultivation to pillar No. 12 on the Kasla Manda ridge between Tehri-Garhwál and Keuntal States.

West.—Along the boundary of Keuntal State to pillar No. 1.

APPENDIX B.

Description of Blo

Number of block.	Name of block.	Area in acres.	Configuration.	Slope.	Altitude.	Soil.	Stock.	Density	Quality.	Reproduction.	Treatment.
					LAMBATÁCH FOREST.						
I.	Inádi ...	321	Very rocky and precipitous slopes between the Kimári and Lohásu blocks, with more moderate slopes above the cultivation of Lohásu. Aspect southerly.	Usually 40° or over.	9,573′ to 7,000.′	Superficial or absent; the gneissic rock constantly exposed.	Usually a succession of grassy and rocky slopes with an open forest of pure deodár, consisting almost entirely of I and II class trees. There are very few kail and chír, but ban is common east of the Paniali gád and predominates in the extreme east. The patches covered with grass or of bare rock only are numerous throughout. Near the Lohásu fields there are some young kail, which, though well distributed, are scattered; this part was evidently *jhúmed* in former days. The deodár having grown up in such an open forest have branches almost to the base. There is a little indigofera scrub here and there.	8 to 5, average 2 to 5, being greatest at the head of the Duádi and Paniáli gáds.	2—5	Very slight; a few kail, deodár and chír seedlings in places.	Nothing to be done
II.	Lohásu ...	275	Consists of all that part of the basin of the Samáni khad included within forest limits. The slopes are very variable and often rather rugged and precipitous in the neighbourhood of the Disti gád. whilst to the south of that stream the ground is less steep and the slopes are more even. General aspect—West, with minor slopes facing north-west and south-west.	Variable, not often over 35° south of the Disti gád.	9,011′ to 6,844.′	Often a deep loam with a good covering of vegetable mould in valleys and on the better clothed slopes; rock usually shale and clay slate.	Consists mainly of old scattered deodar and kail with a few ban and moru. In the upper basin of the Disti gád there is a deodár forest mixed with a few kail, and between this gád and the Samani dhar there are often open grassy slopes containing a few old branchy deodár and one or two kail with a better forest (deodár, oak, burans, &c.,) in the ravines, but the trees are most numerous in the upper part. At the south-west end and bordering on Loidogari dhar there is usually a kail forest, old deodár being very rare, whilst higher up, near the Lohásu dhár, there is a very fair mixed forest of deodár and kail. The undergrowth is usually grass with a little fern, indigofera and desmodium.	Very variable. In upper basin of the Disti gád, 4 to 7 in the kail forest; to the west of the gád 3 to 8.	...	In most places with a north-westerly aspect there is dense advanced growth of kail with usually a good proportion of deodár, but near the Loidogari dhar there are scarcely any deodár seedlings save in the vicinity of the one or two seed bearers. On south-westerly slopes north of the Disti gád the reproduction is not so satisfactory, and some of the open grassy slopes contain but few seedlings. In ravines,	About 40 acres containing young kail near the Lohásu dhar to be planted up with deodár in 1889. The progress of the existing young deodár under the kail to be carefully watched and further thinnings executed when necessary in continuation of that already made over about 205 acres. Selection fellings were made in 1870-75.

											however, the reproduction of kail and deodár=5.	
III.	Chakora ..	291	Contains the upper basin of Banál gád above the upper road from the bungalow to Lohásu. The slopes are moderate and even, being precipitous only near the Molu dhár. Aspect north westerly.	20° to 35°	9,573′ to 7,278′	Ditto ...	Often only a few scattered old deodár. kail and ban or moru, and along the ridge karshu associated with deodár; whilst lower down in the basin of the Banál gád rai of large dimensions were common, but they have all been killed by girdling. There are numerous open grassy slopes.	0 to 6	...	Over the greater part of the compartment there is magnificent advance growth of kail forming dense thickets with young deodár doing the same near its seed bearers, whilst almost everywhere some are to be found coming up amongst the kail. Advanced growth of deodár is also plentiful near the ridge mixed with karshu, but where the girdling has taken place the result has been a dense growth of brambles, wild roses, willows, viburnum, &c., forming almost impenetrable thickets where few deodár seedlings can be found. There is but little reproduction on the rocky and grassy slopes close to Molu dhár.	Thinnings of kail over young deodár have been made over about 120 acres. The result should be watched, and if necessary a further thinning made. In 1874-78 over about 130 acres large fir and other trees were girdled, and of this area about 50 acres should be planted up in 1890. Selection fellings were made in 1870-75.
IV.	Garasna ..	320	Comprises moderate and fairly even slopes between the fire-line, the upper bungalow road and the path leading to Naimtách as far north as the Naini dhár; there is some precipitous ground on the right bank of the Garasna khad. Main aspect west; minor aspects, south, north west and west	30° to 35°	8 346′ to 6,637′	Ditto .	Variable; north of Garásna khad open grassy slopes with scattered ban and very few deodár and kail, with some chír near the fire lines; whilst in the vicinity of the Pathi gád there is a somewhat better forest consisting of ban, deodár and kail South of the Garasna khad in the lower part, we find ban with a few old kail and some usually scattered but fine old seed-bearing deodár, whilst in the upper portion there are pretty many I and II class deodár. The ground is immediately covered with sparse indigofera, ferns, and grass, and in the higher parts with brambles as well.	Extremely variable, usually 2 to 5, but there are numerous open patches.	...	North of the Garásna khad for kail 3, this species forming thickets in places near the Pathi gád. South of the khad there is usually plenty of young kail and deodár, the former predominating and forming dense thickets between the Banál gád and the Samani dhár.	About 165 acres of kail over young deodár have been thinned, and this operation, if necessary hereafter, should be repeated. Selection fellings were made in 1870-75.

APPENDIX B.

Description of Blocks—(continued).

Number of block.	Name of block.	Area in acres.	Configuration	Slope.	Altitude.	Soil	Stock.	Density.	Quality.	Reproduction.	Treatment.
					LAMBATACH FOREST—(*continued*).						
V.	Banárpání ...	227	Comprises the upper basin of the Garasna khad above the Deota road, with usually gentle or moderate even slopes rather steeper to the north of the road and precipitous in one place only Aspect westerly	15° and above.	9,600′ to 7,654.′	Often a deep loam with gneiss in the upper portion.	Mainly a rai and morinda forest and karshu along the main ridge with a proportion of I and II class deodár everywhere up to the ridge In the lower part there is a mixed forest of ban, deodar and kail Over nearly the whole compartment numerous rai and some morinda have been killed by girdling in order to promote the reproduction of deodar; a belt, however, being left ungirdled adjoining the main ridge where deodar are scarce, and the rai and morinda form a dense forest.	In the lower part 3 to 7, in the area girdled 7.	...	A fair amount of advanced growth of kail and deodar in the lower part and of deodar alone near the ridge and on the steep slopes north of the road In the girdled area there are very few natural deodar or rai seedlings, but a dense growth of brambles, willows, senecio, ferns and numerous other plants found in damp places.	In 1874-78 firs were girdled over about 140 acres, and some deodar were subsequently planted. An additional 50 acres should be planted up in 1891. Selection fellings were made in 1870 75.
VI.	Naimitách ..	167	Rather steep and rugged ground, forming the upper basin of the Garásna khad and occasionally precipitous in ravines Aspect south west.	35° 40.°	10,469′ to 8,279.′	As in Dhamti, but still in some places deeper	Near the main ridge chiefly karshu with a few rai and morinda, as also a little deodar and kail in places, the deodar mixing in lower down in the proportion of about 1 to 5 when rai becomes commoner. The deodar is most abundant on the ridges Lower down there is a good mixed forest of deodar and rai in about equal number together with a few kail, the trees being of all classes, whilst between the Patthi and Naini dhars there are open slopes covered with grass, indigofera, desmodium, &c.	6 to 10, with open patches.	...	In the upper part amongst the karshu there are a fair number of well-distributed deodár seedlings, but there are some grassy slopes without reproduction In the open slopes between the Patthi and Naini dhárs there are a few young kail seedlings only.	Nothing to be done but to keep the existing plantation fully stocked. Selection fellings were made in 1870-75.
VII.	Ghoria ..	385	Comprises the upper basin of the Ghatáli khad, the ground being rocky and precipitous near the nu-	35° 40° and sometimes higher.	10,538′ to 7,231.′	Ditto ...	In the upper part karshu, then a dense forest of rai and morinda, with a little deodar near ravines, whilst this species is abundant on rocky precipitous ground,	Extremely variable from 8 to 10 on the higher mode-	...	In the upper part fair on the ridges, there being some rai and a few kail	Ditto.

			merous small streams, but more even and less steep elsewhere, especially near the main ridge. Aspects south, south-west, and south east				where it forms nearly the whole of the stock. In the lower portion, east of the khad on slopes facing west, there is an open mixed forest of deodár, kail, and moru with numerous open patches and narrow open slopes. The deodar are of all ages, but in the lower part III and IV class trees are scarce.	rate slopes to 2 or 3 only on many of the lower slopes, where blanks are frequent.		as well as young deodár with morinda in the shadier places In the lower part, east of the gad on the western slopes, the open places are almost all filled up with kail and deodar seedlings, the former predominating.	
	Dhamti ...	336	Moderate or steepish slopes west of Ghoria dhar between the main Lambatach ridge and the fire-line, facing south.	30° and over	9,976′ to 7,100.′	As in the Inadi block, but not quite so rocky.	Strictly speaking, there is really no forest at all in this block, but only some old branchy deodár and a little kail few and far between, the hot, dry slopes being covered, as a rule, with long grass only These old trees represent, no doubt, the remnants of what had once been a forest, but which has been gradually destroyed by fire.	Usually *nil* ..		Almost *nil*, just a few seedlings of kail and deodár coming up principally under the shade of the old trees.	The attempts to restore this block to be discontinued, the present plantations, however, being kept fully stocked.
IX.	Thunwára ..	519	Contains the portion of the basin of the Bargad gad within forest limits, with moderate and even slopes save for some precipitous ground near the gad just above the fire-line Aspects west and north-west.	20° to 40° not often over 30.°	9 976′ to 6,878.′	A fairly deep clayey loam.	A deodár and kail forest; these species usually occurring in about equal numbers, although sometimes the kail predominates. The forest is patchy, being interrupted by numerous open portions of slopes. Low down, the steep slope north of the Bargad gad and facing south west is covered with grass and clumps of deodar and kail with a few chir, whilst on the opposite slope there is a good mixture of ban and kail with some deodar In the higher parts of the compartment karshu, rai and morinda are the principal trees	Average 4 for the deodar and kail forest.	...	Splendid in the open patches in the deodar and kail forest, the advanced growth of the two species being usually very well mixed, but the kail more often predominating than the deodar, which are absent in one or two places, an occasional rai is also found. On the steep slope facing south-west near the gád the seedlings are mainly kail and chír, reproduction varying from 0 to 5, average 2, whilst on the opposite slope the reproduction of kail is very good, but there is not much deodár.	Thinnings of kail over deodár have been made throughout this block, and the progress of the young deodár should be carefully watched, further assistance being given to them when required. Selection fellings were made in 1870 75

APPENDIX B.

Description of Blocks—(continued).

Number of block.	Name of block.	Area in acres	Configuration	Slope	Altitude.	Soil.	Stock.	Density.	Quality.	Reproduction.	Treatment.
					LAMBATACH FOREST—(*concluded*)						
X	Kandár ...	42	A detached block south west of Karoh village, lying in a slight hollow, at a low elevation with gentle even slopes facing west by north-west.	15° to 25.°	6,610′ —6,300′	A fairly deep clayey loam	A few old branchy deodár and some old kail, which are useful as seed bearers together with, here and there some broad leaved species, such as bán, burána syar and the wild pear, the ground being immediately covered with grass or bushes such as barbery. The dry slope north of the stream and facing south-west is clothed with grass and a few old deodar In this block there are no intermediate classes between the old trees and the advanced growth The young kail has a very rapid growth often increasing in height two feet or more in the course of a year	...	...	In most places there is a plentiful advanced growth of kail and deodar, the two being often well mixed, but in some spots there is scarcely anything but kail there are also a few ban and burans seedlings On the dry, south-westerly slope there are only a few scattered chir and kail seedlings.	Nothing to be done. Selection fellings were made in 1870-75
					DEOTA FOREST.						
I.	Tadiár	576	Rather precipitous ground with frequent outcrops of rock, easier grassy slopes in the northern portion, and some flat ground near the Bhagiar gád Aspect south-westerly.	35° to 45°	7,618′ — 3,660′	Deep near the Bhagiar gad and above chabai elsewhere superficial, sub-soil a a red clay	Chiefly chir with a variety of trees in the valley, such as shisham, alder, ban, sandan, rihta and hill tun	...	...	..	Nothing to be done
II.	Pártil ...	775	Moderate slopes predominate, but the ground is steep along the main ridge above the bungalow and precipitous in compartments 1 and 6 overlooking the Bhagiar gad Aspects westerly and south-westerly.	Ruling 25° to 30°, but 45° and over in compartments 1 and 6	9,266′ — 4,160.	A deep sandy loam with a red clay sub soil and often with a a deep layer of humus especially in the oak forest, on precipitous ground superficial or absent, exposing the gneissic rock.	Variable, on the moderate slopes in compartments 3 and 4, a mixed forest of deodar, rai and moru, the first named species usually predominating, whilst there is an undergrowth of indigofera, desmodium brambles, &c The second class deodar are in many places remarkably fine and numerous, their stems being tall, straight and unbranched up to a considerable height, but in open places they are branchy. In the higher parts near the main ridge deodar become	0 to 10 average 5.	...	Many of the open slopes are getting covered with kail seedlings, and in places where there are seed bearers with deodár; elsewhere in the upper forests reproduction is good as a rule, 6 for deodár and rai, and in [illegible]	

							scarce, and karshu enters into the crop; at lower elevations there is usually a mixture in variable proportions of deodár, kail, ban, burans, ayar, a few maples and an occasional rai, the oak predominating in the upper part of compartments 1 and 5, and in the lower part of compartment 2. Still lower, at the bottom of compartment 1, and throughout compartment 6, there is a chír forest mixed with numerous ban in the upper portion, which species runs far down in ravines. Open slopes covered with grass or with indigofera scrub are common throughout the block, especially in compartments 2 and 5.			partment 4 there are a very fair number of young moru; but there are very few seedlings in the indigofera scrub. In the chír forests reproduction varies from 2 to 6, being usually excellent in most places in compartment 6, where there is any soil.	
III	Temple ...	365	Consists for the most part of even and easily sloping ground, but steep or precipitous near the gád, and occasionally near the main ridge as above Deota Temple, and also in compartment 1. Aspect west by south.	20° to 35°; sometimes over 45,° as near the gád.	9,397′ to 6,500.′	A deep subsoil of red clay with rich dark loam and humus above, with rock either gneiss or mica schist occasionally outcropping.	Immediately below the main ridge a forest of rai and morinda with a fringe of karshu, or that species mixed with the firs; then a mixed forest of deodár, rai and morinda, the two latter species predominating on the gentle slopes, the latter on the steeper ones, then a mixed forest of deodár, ban and moru; sometimes one, sometimes the other, predominating with a few rai in damp places; and finally in the lowest portion, close to the Jaurási road an open forest of ban, a little burans and ayar with some chír and a few kail and deodár, chír being more common below the road, the deodár and kail less so. The ringing operations carried out in 1881 in compartments 3 and 4 have been fairly successful, and the large number of II, III and IV class deodár which have had their crowns freed are looking very vigorous. There is usually an undergrowth of senecio, ferns, a few brambles, &c., on the damp easy slopes.	5 to 9 and 3 only in lower part of compartment 5.	...	Advanced growth good in places in compartments 1 and 2, but reproduction very slight in compartments 3 and 4. owing to the dense cover. In the upper part of compartment 5 some young deodár; 2; in lower part, 3, kail and chír seedlings gradually filling up the more open slopes.	
IV.	Dopta ...	280	Very rocky and precipitous ground between the main ridge and the Temple and Katatách blocks, compartment 3 being simply a series of precipices. Aspects south and south-east.	Usually over 40°.	10,355′ to 8,500.′	Superficial or frequently absent, the gneissic rock being constantly exposed.	In the highest portion mainly a well-stocked karshu forest with a few yew and stunted deodár running high up the ridges, whilst there are also a few scattered rai and morinda with an undergrowth of ringal; lower down there is a good forest of almost pure deodár with a very few rai and morinda, whilst on the precipices elsewhere there are scattered deodár wherever there is a handful of soil between the rock masses.	0 to 10	...	Good seedlings most common on the ridges.	Selection fellings were made in 1877-81, and all remaining exploitable trees should be cut in 1891.

APPENDIX B.

Description of Blocks—(continued).

Number of block.	Name of block.	Area in acres.	Configuration.	Slope.	Altitude.	Soil.	Stock.	Density.	Quality.	Reproduction.	Treatment.
						DEOTA FOREST.					
V	Katatách ..	380	For the most part very rocky and precipitous ground, compartment 5 being unworkable, with some more moderate slopes in the middle of the block in compartments 2 and 4, lying between Kolloti gád and the Jaurási dhár. Aspects east and south east	Seldom less than 35° and frequently 45° and over.	10,229′ to 4,600.′	Usually superficial or absent with the gneissic rock laid bare; better in compartment 4.	In compartment 5 a pure deodár forest, with badly-grown branchy trees; elsewhere usually a mixed forest of kail, deodar, ban or moru, in variable proportions, associated sometimes with burans and ayar, whilst chír enters into the stock at low elevations, forming a pure forest in compartment 1. The deodár are finest in compartment 4, where most of them have straight, well-grown, symmetrical stems free from knots. Grassy slopes are common in compartment 2.	3 to 9, densest in compartment 4; 2—3 only to the chír forest.	...	Good for kail, deodar and chír, where the cover is not too great. The lower road is completely choked with kail and deodár seedlings.	Selection fellings were made in 1882-83, and all remaining exploitable trees must be worked out in 1891 Thinnings to be made in the same year, chiefly in compartment 4.
VI.	Jaurási ..	564	Usually rocky and precipitous ground, between the Jaurási dhár, the Kanga gád and the Bashaltú dhár facing south, south west, and in the case of compartment 5, south east. There are some moderate slopes in compartment 2.	35° and over.	10,229′ to 4,600.′	Usually a shallow, sandy loam or absent, with the exposed gneiss showing almost everywhere.	Near the main ridge mainly karshu and rai with a few scattered deodár; then lower down in compartments 4 and 5, chiefly deodár with a few other species, such as rai and oaks, with some walnut, maple, and horse-chestnut near the main stream; then open grassy slopes in compartments 2 and 3 with scattered ban, kail, deodár and a few burans and ayar; finally over the greater part of compartment 1 a chír forest.	0 to 6, in chír forest 2 to 3.	...	Patchy, 0 to 8; for chír 5.	Selection fellings were made in 1883-84, and all remaining exploitable trees should be worked out in 1891, blanks being planted up. Thinnings to be made in 1893, principally in compartments 4 and 5.
VII.	Kánga ...	323	For the greater part rocky and precipitous, the ground between the Kánga gád, the Bashaltú dhar and the Kánga dhar being often covered with loose masses of rock, with short easier slopes between the precipices. In the lower half of compartment 3,	35° and over, but less in part of compartments 3, 4, and 5.	10,469′ to 6,500.′	Absent or a shallow sandy loam, with a little humus. In compartment 4 deeper with a good layer of humus.	In the upper part of the basin a few scattered deodár, but mainly karshu with some rai and morinda; lower down a deodár forest with some rai, and a very few morinda, moru and burans; whilst on the moderate slopes in compartments 3, 4, and 5, there is a mixed forest of rai deodár, and some morinda and kail. The III and IV class deodár are numerous, well-grown, tall, straight and free of	0 to 10; average 5 to 8.	...	Good, except where the cover is too dense; kail seedlings are the most conspicuous.	Selection fellings begun in 1886 to be completed in 1888. Thinning was carried out over 20 acres in compartment 4 in 1886, and further thinnings throughout the block should be

			in compartment 4, and the upper part of compartment 5, moderate and even slopes. Aspects south and south-east.				branches. Below the Kimari road the species are ban and chír with a few kail and scattered deodár.					made in 1893.
VIII.	Patángni ...	693	Consists of the basin of the Kángi gád between the Kángi and Patángni dhars. Very similar in configuration to the Kánga block being, for the most part, rocky and precipitous, but with long, even, moderate slopes, with occasional massive outcrops of rock in the lower half of compartment 3, in compartment 4 and in the upper corner of compartment 5, which face the north. Main aspect easterly, with minor northerly and southerly ones.	40° and over, but in the portions facing north 20° to 30°, not often above 25.°	9,800′ to 4,160.′	A shallow, sandy loam, often absent, deep and rich only on the northerly slopes.	On the steep slopes in the higher part of the basin generally an almost pure deodár forest with a few scattered rai, kail and oak. The large trees are somewhat branchy and above the Lambatách road stunted; those of the III and IV class are numerous. Immediately below the Chaukuri tiba there is a forest of karshu, rai and a few deodár. On the moderate slopes in compartments 3 and 4 there is an oak forest of moru or ban with some magnificent deodár and a few kail, but ban, burans and ayar predominate near the gád together with a few chír; on the rocky ground in compartment 5 and in the lower part of compartment 1, there is chír, with ban in ravines; in compartment 1, just below the Lambatách road, there are grassy slopes with a few scattered young kail and some large deodár on the ridges. There is a dense shrubby undergrowth of desmodium, indigofera, myrsine, with advanced growth of deodár and kail throughout most of the oak forest.	0 to 10, average 5 to 8, densest in the oak forest, 6 to 10.	3—10	Very variable in compartments 1, 2 and 5; in parts of the oak forest magnificent for deodár and kail, and very good for deodár near the Chaukuri dhar.	Some ringing was done in compartment 4 in 1886. Selection fellings are to be made in 1888-89, and thinnings in 1893, compartment 3 being also thinned in 1898. Little can be done in compartments 1 and 5.
IX.	Kimári ...	420	Rocky and precipitous ground facing south-east, but with open even and moderate slopes in most of compartment 2, and also along the Jokoni dhár.	35° to 40° and over, but only 25° in compartment 2.	9,437′ to 4,160′	A poor superficial sandy loam, save in compartment 2, where it is clayey and fairly deep with a good layer of humus.	In the upper portion mainly an oak forest with a mixture of deodár, burans, ayar and a few kail and a thick undergrowth of indigofera, desmodium, &c.; there are numerous open patches in compartment 1, whilst compartment 3 is stocked almost entirely with chír.	0 to 8; average 5.	4 to 8	Good for kail and deodár; the open patches are being rapidly filled up with seedlings.	Selection felling in 1889; thinnings in 1895 and also in 1889 in compartment 2.
X.	Bhagiár ...	561	Comprised between the Bhagiar gád, the outer fire-line and the Kimári block. The ground is precipitous and rocky throughout, save below Kimári village, where the slope is easier. Aspects south, north-east and east.	About 30° below Kimári, elsewhere 50°.	7,600′ to 3,560.′	Shallow as a rule, but deeper near Kimári.	Near Kimári village there is a mass of ban, burans and moru, with a few deodár and some kail; but the main part of the block is stocked with small chír, the finest trees being found in the ravines, where are also many evergreen trees and shrubs as well as some kakkar, shisham, &c.	...	...	Deficien save in ravines and on the easier slopes.	Can only be utilized in providing chír timber for slide, and some fancy woods from the valley.

APPENDIX B.

Description of Block—(continued).

Number of block.	Name of block.	Area in acres.	Configuration.	Slope.	Altitude.	Soil.	Stock.	Density.	Quality.	Reproduction.	Treatment.
						BAMSU FOREST.					
I	Pipal ...	908	Rocky and precipitous ground on the left bank of the Bamsu gád, but with a considerable area of moderate slopes especially near the ridges and over nearly the whole of compartment 4, where there are some old terraced fields. Aspect south-westerly.	Usually from 35° to precipitous.	10,421′ to 6,700.′	Shallow as a rule, the bare rock being often visible. In compartment 4 fairly deep on the terraces.	Over the greater part of the block there is a fairly good forest of deodár with rai, a little morinda and a few broad-leaved species such as moru, especially near the gád; whilst along the bed of the stream are to be found birch, horse-chestnut, a few walnut, &c., in the upper part of compartment 3, karshu, rai, and morinda are common, with a few scattered deodár, and in the lower portion of compartment 4 there are grassy slopes with scattered deodar and kail, and a few small ban, burans, and ayar.	0 to 9; usually 6 to 9.		Usually deficient, but on grassy slopes in compartment 1 there are numerous young kail with some deodar, and in compartment 2 chiefly kail.	Selection fellings in 1894 Thinnings in 1889 and 1898. In Pipal, 4, 50 acres to be planted up in 1895.
II	Dhikuri ...	701	Rocky and precipitous ground on the right bank of the Bamsu gád from the main ridge to the Biúnra dhár. Short moderate slopes are, however, to be found throughout amongst the more precipitous ones. North of the Udiari gád a good deal of the ground is unworkable. Aspect north-easterly	Ditto.	10,355′ to 6 567.′	Loam; shallow or absent on the ridges to deep in ravines, where there is often a good layer of humus.	Mostly a dense forest of deodár, rai, morinda and some kail. In some damp places rai predominates, and girdling operations might be undertaken to encourage the deodar. Deodár is especially abundant on ridges and other places which receive most light, fine, tall, straight trees being numerous There are one or two cypress here and there, and a few oak in places; compartment 3 mainly contains karshu with some rai and a few scattered deodár.	7 to 9, but less on the more precipitous places.	4 to 10	Not much advanced growth or many seedlings, owing to the dense cover; and what exist are mainly morinda with a little deodár on the ridges.	Selection felling in 1892-93. Thinnings in 1888 and 1887.
III	Bamsu ...	714	Mostly moderate or steepish slopes south of Dhikuri, and between the Pártil block and the Bamsu gád, facing east; but the ground is often precipitous near streams, and in compartment 3 facing south is very rocky and precipitous, as well as a portion of compartment 4.	30° and over.	9,134′ to 5,700.′	Loam; shallow or absent on the ridges to deep in ravines, but without much humus.	Very variable. In some of the higher portions a good deodár forest almost pure or mixed with kail, ban or moru with an occasional morinda or rai; in other parts a very open forest of deodár, kail, and rai, with extensive grassy slopes, those facing south being usually the barest; whilst in the lowest portions ban, burans, ayar and chír form most of the stock. In compartment 3 there are bare open slopes containing scattered deodár, kail, and ban, the latter being abundant to the west.	0 to 10	2 to 10	Slight in compartments 3 and 4, elsewhere often good, especially for kail; the southerly slopes are gradually being filled up with seedlings of this species, with a few deodár and some chír in the lowest parts.	Selection fellings in 1892. Thinnings in 1888 and 1896.

						SARAS FOREST.					
I.	Damrali ...	664	Moderate even slopes, broken now and then by lines of precipitous ground, running about north and south, comprised between the Bamsu forest, the Dhamrari gad and the Kánda dhar. Aspects northerly and easterly, and in compartment 3 southerly	30° to 45° and over.	10,421′ to 6,949′	In the portions facing north and east, a deep moist loam on the less precipitous ground, and in compartment 3 a sandy and superficial soil with quartzite rock often showing.	On the northerly and easterly slopes a forest of rai, morinda, deodar and kail, the two former predominating almost throughout, being almost the only trees except karshu in the higher portions, deodár is most abundant on the precipitous ground and along ridges; kail and ban are commoner in the lowest part and also in compartment 3 associated with a few deodar which, together with rai, becomes numerous in the upper part of the compartment.	7 to 9 but 0 to 6 only in compartment 3.	3 to 8	Deficient owing to the dense cover; some kail and a few deodár seedlings in compartment 3.	Selection fellings in 1895-96 Thinnings in 1890 and 1899.
II.	Kánda ...	350	Steepish ground with occasional moderate or precipitous slopes facing east above the cultivation of Sarás. Aspect north-easterly.	35° to 45.°	10,000′ to 7,400.′	Superficial loam with underlying rock, gneiss or mica schist.	A forest of rai, deodár and some kail with a few broad-leaved species, ban meru, burans, áyar, &c., with some open places, in the north-west of compartment 1 there are open grassy slopes with here and there small clumps of trees, rai, deodár, kail, ban, burans and áyar, and these are also scattered in small numbers over the otherwise bare slopes.	7 sometimes very open, as in part of compartment 1.	2 to 6	In open places in compartment 2, numerous kail seedlings, with a few deodár; seedlings less common in compartment 1	Selection fellings in 1895. Thinnings in 1890 and 1899.
						KOTIGÁD FOREST.					
I.	Bálcha ...	480	Moderate, even slopes, occasionally steep near ravines, included between the Shalu dhár and the fire-line and facing north	20 to 35 °	9,562′ to 7,300.′	A deep rich loam with good leaf-mould in parts. Superficial on south westerly slopes above the Shalu gad.	Over the greater part of the block a very good and dense forest of rai and morinda with some deodár especially on ridges, and a few kail In the lower part of compartment 2, east of the Shálu gád the stock consists of deodar with a few rai and morinda; west of the gád of deodar and bán with a few kail and rai.	8 to 10, but 6 only in lower part of compartment 2.	5 to 10	Seedlings scarce owing to the dense cover.	Thinnings in 1901.
II.	Murálı ...	1044	West of the Bálcha block as far as the Máli dhar moderate slopes prevail, but the ground is occasionally precipitous near streams and is usually steep on westerly slopes, as in compartment 1 General aspect north, minor aspects north-east, west and north west.	20° to 40.°	10 421′ to 7,500′	A fairly deep moist loam with occasional outcrop of rock. Superficial in compartment 1.	In the higher parts very few deodár, but a dense forest of rai, morinda and some karshu, except in the east part of compartment 6 where the forest is more open and karshu is commoner; lower down deodár mixes in more freely becoming common on ridges On the south westerly slopes above the gad there is an open forest of bán with a few kail whilst in compartment 5 the slopes are often only covered with grass or contain a few scattered kail and bán, but towards the gád there is a better stock of kail and ban with a few scattered rai and deodár.	In the fir forest 8 to 10, elsewhere 0 to 6.	3 to 6	Scarce in the fir forest. In compartment 5 excellent for kail, seedlings coming up in large patches, but there are few deodár, which is doubtless due to the absence of seed-bearers.	Thinning in 1903 150 acres of open slopes in compartment 5, containing young kail, to be sown and planted up with deodar in 1892 95.

APPENDIX B.

Description of Blocks—(continued).

Number of block.	Name of block.	Area in acres.	Configuration.	Slope.	Altitude.	Soil.	Stock.	Density.	Quality.	Reproduction.	Treatment.
					KOTIGÁD FOREST (*continued*).						
III	Ola ...	2,444	West of the Muráli block as far as the Gáji deár moderate and steepish slopes prevail with occasionally precipitous ground above ravines, and also to the east in compartments 1, 2, and 3	20° to 40.°	10,538′ to 6,814.′	On the moderate slopes a fairly deep clayey loam with a good layer of humus in places.	In the higher part, skirting the main ridge and including the whole of compartment 7, the stock is almost entirely karshu, rai, and morinda, with very few and scattered deodár; lower down on favourable aspects there is a mixture of rai, morinda, deodár, and kail, the two former being abundant at the higher elevations, the kail at the lower, but the deodár very seldom predominates; oaks are common near the fire-line. In compartment 1, there are open grassy slopes with a scattered forest of badly grown deodár, kail, a few rai and oak. In compartments 5 and 6 there are extensive open grassy fern-clad moderately even slopes immediately above the fire line, containing some old and scattered kail besides one or two deodár, rai and moru.	In the fir forest 7 to 10, elsewhere 0 to 7.	...	Unsatisfactory in compartments 1, 2, and 3; elsewhere in the deodár and fir forest the open patches are being filled up with rai and kail seedlings with a few deodar. In the open fern-clad slopes or compartments 5 and 6, the reproduction of kail is often excellent, and numerous seedlings are just pushing their heads up through the fern; but owing to the absence of seed-bearers, there are scarcely any deodár, save in the immediate neighbourhood of the few large trees of that species	Thinnings in 1904. 350 acres of open slopes in compartments 4, 5, and 6 containing young kail or scattered ban and kail trees, to be sown or planted up with deodár from 1897 to 1905.
IV.	Gokal ...	1,295	Included between the Maunda and Bilcha blocks. There is a large area of moderate and even gentle slopes in the south-west, but elsewhere the ground is steep and precipitous near streams and along the main ridge. Aspects westerly and south-westerly.	20° to 40° and over.	10,436′ to 7,400.′	Excellent on most of the easier slopes, with a good deal of humus; but in compartment 1 superficial and humus absent.	On the moderate slopes to the south-west (Bitta Bálcha) there is a well-stocked forest of rai and morinda with a few fine well-grown deodár; there are also some broad-leaved species such as maple walnut, &c., and some karshu in the higher parts; elsewhere chiefly deodár with a few kail and rai. The deodár is usually much branched, but there are some very fine trees in compartment 2 reaching to a girth of 25 feet; grassy blanks are not uncommon, and many trees have been killed by fires. On the steep slopes above the	7 to 10 in fir forest, 3 to 10 in deodár forest.	3 to 9	1 to 2 for deodár in the fir forest, being slight owing to the cover; and elsewhere, where fires are common, but where they appear to be rai 4.	Thinnings in 1901.

							Roitu gád there is a mixed forest of kail, deodár, ban, and some ayar, &c.					
I.	Duchánu ...	260	Very rocky, precipitous and often inaccessible ground, facing south above the village of Duchánu.	Generally over 40.°	...	Superficial or more often absent.	Chiefly deodár, rai being also common in the upper part. The trees are much branched and only a small proportion of them on the less precipitous ground can be worked out.	Very variable, 1 to 7 with occasional blanks.	3 to 4	Usually *nil*.	Nothing required, unless, perhaps, a little thinning in 1903.
II.	Jágta ...	540	Very rocky, precipitous and often inaccessible ground above the village of Jagta, the general aspect being easterly, with northerly and southerly slopes on either side of the gád.	Ditto.	...	Superficial or more often absent, but a good loam with layer of humus in a few places.	Mostly deodár of inferior quality, sometimes pure, sometimes mixed with rai particularly in the upper part, with a few kail lower down; whilst near the outer forest boundary the stock is mainly composed of bán and buráns. Many trees have been damaged by fire.	Very variable, 1 to 10 with numerous blanks.	3 to 4	Often *nil*, but in places of deodár 3, whilst there are some kail seedlings in the middle of the block.	Ditto.
						CHÁNSIL FOREST.					
III.	Dedragád ...	2,355	All that portion of the basin of the Dedra gád included within the forest boundary and some slopes, to the east, draining directly into the Koti gád. The main aspects are north-east, west and south-west, with minor aspects facing north-west and south-east. On the western side the right bank of the tributary streams facing the north-west consist usually of fairly even ground with pretty regular moderate slopes, whilst the left banks facing the south-east are rocky and precipitous, as also are those slopes directly overhanging the main gád; on the eastern side the slopes are variable, but are not often precipitous.	On north-westerly aspects 25° to 35°, on south-easterly 40° to 50° and over.	...	A good loam with plenty of humus on the moderate northerly slopes, but elsewhere superficial or absent with an outcrop of rock.	On the right bank on the moderate northerly slopes there is usually a dense forest of morinda and rai with some kail, deodár, moru, and ban in the lower parts, some karshu along the main ridge and generally an undergrowth of yew. The deodár occur chiefly along the ridges, but the finest trees have already been extracted. On precipitous ground there is an open and indifferent forest of scattered deodár, kail, rai, with ban and burans in the lower parts, and a forest of morinda, rai, and karshu above. On the left bank in compartment 8 towards the main ridge, there is a karshu forest, and lower down on westerly slopes, a dense forest of morinda and rai with karshu along the higher, moru and kail along the lower ridges. In compartment 10 there is a very open forest of scattered ban, moru, deodár and kail, the deodár being very branchy, but few being of any use for sawing purposes. There are five "chaks" in the block.	In the fir forest 8 to 10, on precipitous ground 3 to 4, with numerous blanks.	2 to 6	Under the dense cover of the fir forest only morinda seedlings are common, elsewhere reproduction is but seldom good, perhaps owing to fires, but young kail are found filling up some of the blanks.	A selection felling was made in 1881, and dry logs left over from this felling are now being cut up (1897). Thinnings to be made in 1903.
IV.	Andrigád ...	1,885	Comprises the basin of the Andri gád, the ground being for the most part rocky and often precipitous, the best slopes being found in compartment 2.	35° to precipitous; as a rule over 35°.	...	Superficial or absent, the bare rock being constantly exposed, but there is a good rich loam with plenty of humus in ravines and near the gád as well as on some moderate slopes.	In the upper part (compartment 3 and upper part of 2) a rai, morinda and karshu forest, elsewhere chiefly deodár with a variable proportion of rai and morinda with moru and other broad-leaved species common near the gád; kail also occurs, especially in the lowest parts of the block.	7 to 9	...	Almost *nil* save in the lower parts of compartments 2 and 4, where it varies from 2 to 6 for deodár, and there are also some seedlings of rai, morinda and kail.	Selection fellings made in 1884-86, and more trees should be felled in 1904. Thinnings to be made in 1899.

APPENDIX B.

Description of Blocks—(continued).

Number of block.	Name of block.	Area in acres	Configuration.	Slope.	Altitude.	Soil.	Stock.	Density.	Quality.	Reproduction.	Treatment.
			CHÁNSIL FOREST—(*concluded*).								
V.	Boktáragád ...	1,575	Comprises the basin of the Boktára gád and some slopes to the east and west overhanging the Koti gád. The ground is usually rocky and precipitous, with a few moderate slopes, which are nearly universal in compartment 1.	35° to precipitous; as a rule, over 35°.	...	Superficial or absent, rock showing everywhere.	In the upper part (chiefly compartment 3) a forest of karshu and firs; lower down deodár and rai with some morinda, a few kail with broad-leaved species, such as moru, horse-chestnut, maple and walnut, near the gád. Compartment 1 is mainly stocked with grass land regularly burnt for grazing, whilst here and there are some scattered deodár and kail, ban, and oak occurring near the gád	6 to 8; in compartment 1 0 to 3.	2 to 8 ..	Very scarce ...	Selection fellings in 1904. Thinnings in 1899. Nothing to be done in compartment 3.
VI.	Tára Mundal ...	4,290	The upper basin of the Kothi gád between the Boktára and Maunda blocks. It consists of rocky and precipitous southerly slopes and more moderate northerly ones, the latter being mainly on the left bank of the gád.	30° to 45° and above.	...	Superficial or absent, rock showing everywhere on southerly slopes; fairly deep and good elsewhere.	On the moderate northerly slopes and throughout compartment 1 a forest of rai and morinda with moru or karshu, the stock being a dense one as a rule, and there are only a very few deodár. On the warmer slopes deodár predominates, sometimes pure, at others mixed, with a varying proportion of rai and morinda, a few kail and some moru. In compartment 3 there are a few box trees of inferior quality near the gád.	On northerly slopes 7 to 10, elsewhere 3 to 6.	...	Deficient ...	Thinnings in 1902. Nothing required in compartment 3.
VII.	Maunda ...	900	Above the village of Maunda, between the Tára Mundal and Gokal blocks, the slopes are moderate save in compartment 1, where they are rocky and precipitous. Aspect westerly.	20° to precipitous; usually about 25°.	...	A rich and moderately deep loam with a good layer of humus except in compartment 1.	In compartments 2 and 3 a thick forest of rai and morinda with some moru and a few scattered young deodár; maples are pretty common, and there is an undergrowth of staphylea, ringáls, &c. In compartment 1 there are numerous well-grown deodár with some kail and rai. There is a karshu forest along the main ridge.	In fir forest 10; in deodár forest 5 to 7.	8 ..	Deficient; often no deodár seedlings.	Thinnings to be made in 1902.
			SÁHLRA FOREST.								
I.	Moriru ...	1,865	...	...	...	Description missing.	...	...	...	...	Selection fellings in 1896. Thinnings in 1891 and 1900.

II.	Kángagád ...	7,315	Comprises the basin of the Kanga gád. The slopes facing the north are even and moderate, whilst those facing south are rocky and precipitous, but are workable save most of compartment 6.	[illegible] to precipitous.		On the northerly slopes an excellent loam of a fair depth; on southerly ones superficial or frequently absent.	On northerly slopes a dense forest of rai, morinda, moru, &c., with usually very few and scattered deodar chiefly on the ridges, but this species is abundant in some places as in bits of compartment 4, whilst near the gád in compartment 4, there is a dense pole forest of fine young trees; karshu is common along the main ridge. On the southern slopes deodár is the predominant tree, sometimes pure sometimes mixed with a few kail or rai. Near the gád in compartments 1, 3, and 4, are some box trees, numerous moru and soom ringals abound.	In the fir forest 10, elsewhere 0 to 6.	5 to 10 ...	Indifferent for deodar, due probably to fires, 8 for box.	Selection felling in 1897. Thinnings in 1892 and 1901.
III.	Deotalgád ...	1,310	Consists of the basin of the Deotál gád. The slopes on the right bank facing for the most part north and north east are moderate, whilst those on the left bank facing west by south are very precipitous and unworkable.	25° to 35° on right bank, precipitous on left bank.	...	A good loam, moderately deep with a good layer of humus on the right bank; rock generally exposed on the left bank.	The lower part on the right is stocked with kail and deodár, then comes a forest, young in places, of rai, moru, morinda and karshu, with few but generally fine deodar or kail; near the gád moru and soom often predominate. Ringals are abundant. The left bank (compartment 4) has not been valued.	Usually 10 on the right bank.	8 to 10 ...	Deodár seedlings fairly numerous in the lower parts, but frequently suppressed.	Selection fellings in 1897. Thinnings in 1893 and 1902; compartment 4 is useless.
IV.	Kunigád ...	1,545	The basin of the Kuni gád consisting of moderate north-easterly slopes, rocky and precipitous south-westerly ones, whilst most of compartment 4 is unworkable.	25° to 35° and on south-westerly aspects precipitous.	...	Ditto ..	On north-easterly slopes in the lowest part a forest of bán with some large well-grown deodár, rai and moru, with a few morinda and towards the main ridge chiefly rai and karshu with a few morinda and moru and scattered deodar. The ground is well-covered with numerous under shrub and ringáls are plentiful. On south-westerly slopes the stock is almost pure deodár, and in compartment 4 only the few workable pieces have been valued.	Fir forest 8 to 10, deodár forest 0 to 8.	5 to 8 ..	...	Selection fellings in 1897 and 1898. Thinnings in 1894 and 1903.
V.	Dwántigád ...	990	The basin of the Dwánti gád. Moderate slopes prevail, but the ground is precipitous towards the main ridge, and also on some of the south westerly slopes. Aspects east and west.	3° to 40° and above.	...	Ditto ..	In the lower parts the stock consists of kail scattered deodar and ban, with many blanks probably due to fires; then as the stream is ascended, bán and deodár become more common and kail less so until a fine deodár forest is reached with some rai and a few kail, the deodár extending almost to the main ridge; but it is there of inferior quality, as is also the case on the more precipitous parts.	On easterly slopes 10, elsewhere 8.	On easterly slopes 10, elsewhere 5.	Kail forest 1, ban and deodár forest 4, deodár forest 1 to 10, being best in compartment 1, above where fires have occurred.	Selection fellings in 1898 and 1899. Thinnings in 1895 and 1904.

APPENDIX B.

Description of Blocks—(concluded).

Number of block.	Name of block.	Area in acres.	Configuration.	Slope.	Altitude.	Soil.	Stock.	Density.	Quality.	Reproduction.	Treatment.
						SAHLRA FOREST.—(*concluded*).					
VI.	Siligád ...	805	The basin of the Sili gád. The slopes, save for precipitous ground bordering the gád are moderate on the right bank, more or less precipitous and often unworkable on the left bank. Aspects east and west.	25° to precipitous.	...	A good loam, moderately deep with a good layer of humus on the right bank; rock generally exposed on the left bank.	On the right bank in the lower part a forest of laurels, moru, &c., near the gád with deodár, rai, and kail above, the latter being abundant near the junction of the Dwanti and Sili gads; higher up a splendid deodár forest with a few rai, moru and kail; on the left bank, on most of the workable ground, there is a good deodár forest with a few rai and morinda and a little moru near water.	6 to 10 ...	6 to 10 ...	2 to 10 seedlings being most scarce in the kail forest, which has probably been subject to fires.	Selection fellings in 1899 and 1900. Thinnings in 1896.
VII.	Jodargád ...	1,800	The basin of the Jodar gád. Some moderate slopes are found on the right bank but there is very precipitous and unworkable ground for some distance from the main ridge on both sides with some fine waterfalls; there are also some moderate slopes on the left bank, but they are interrupted by precipices running east from the gád to the main ridge. Aspects east and west.	35° to precipitous.	...	Ditto, but a good deal of rock showing on the right bank.	On the right bank the lower part contains a scattered deodár forest with some kail and much grass, and it is generally burnt; higher up there is a denser forest still nearly entirely of deodár, but many of the trees are very knotty; on the left bank deodár is also plentiful, and there are some magnificent trees; the moru oak is very common and often predominates mixed with some deodár, rai, maple, &c., and sometimes there is quite a young forest of moru associated with the above mentioned species and with kail.	3 to 8 on right bank, elsewhere excluding the precipitous ground, 8 to 10.	2 to 10 ...	On right bank 0 to 3 on left bank 0 to 6, moru seedlings common.	Selection fellings in 1900 and 1901. Thinnings in 1897.

APPENDIX C.

Description of Compartments.

Number of block.	Name of block.	Number of compartment	Area in acres.	Configuration.	Slope.	Altitude.	Soil.	Stock.	Density.	Quality.	Reproduction.	Treatment.
							DEOTA FOREST.					
I	Tadhár ...	...	576	Not divided into compartments.					...	...	...	Nothing to be done. This block will do little more than provide chír timber for slides and fancy woods from the valley.
II	Pártil ...	1	165	Mostly precipitous ground, the bare rock being constantly exposed, facing west and south-west.	50° as a rule	7,600′ to 6,500′	Absent or superficial; rock gneissic.	In the lower part an open chír forest with bán oak in the ravines the peuplement being interrupted by a number of small grassy slopes. Near the main ridge there is a mixed forest of bán, kail and some deodár, the latter being usually rather branchy.	Average 5,	3	2 There are some chír seedlings on the grassy slopes.	The precipitous ground renders regular work impossible. No green trees can be cut. In 1886 most of the dry trees and a few green trees were felled.
		2	222	The lower part consists of steep ravines and sharp rocky ridges, with occasional easy slopes. Near the main ridge the ground is unbroken and more level. Aspect west.	20° to 35.°	9,124′ to 7,500.′	Red clay with a clayey loam above; soil deep on the easier slopes and in ravines; good humus under the oak forest. Rock gneiss, mica schist or quartzite.	Very variable; here and there some fine patches of forest, being a mixture of deodár, kail, bán, a little burans and áyar and an occasional rai with indigofera scrub; then again mainly bán oak with a few kail or patches of deodár forest with a few kail, interrupted by large open grassy slopes There are many dead deodar of different ages, probably killed before the reservation of the forest.	0 to 10 ...	2 to 10 ...	Many of the open slopes are getting covered with kail seedlings, and, in places where there are seed-bearers, with deodár.	All dry deodár were removed and a selection felling of green trees made in 1876-77. To encourage deodár in the upper portion firs, where they predominated, were rung, as also were some kail. Remaining exploitable trees to be felled in 1890, and thinnings to be made in 1888; after the fellings all blanks to be planted up.

APPENDIX C.

Description of Compartments—(continued).

Number of block.	Name of block.	Number of compartment.	Area in acres.	Configuration	Slope.	Altitude.	Soil.	Stock	Density.	Quality	Reproduction.	Treatment.
				DLOTA FOREST—(*continued*)								
	Pártil—(*contd.*)	3	146	Fasy slopes not much broken up by ravines, but steeper towards the main ridge where the ground is occasionally precipitous. Aspect south west.	Seldom over 25.°	9 134′ to 7,600.′	Deep, subsoil red clay with a thick layer of humus above, rock gneissic.	Variable, but essentially a deodár forest with rai, a few moru and an under, growth of indigofera, desmodium, brambles, &c; the second class deodar are in many places remarkably fine and numerous, their stems being tall, straight and unbranched up to a considerable height The rai are not, as a rule, sufficiently numerous to interfere with the deodar There are occasional treeless slopes, as immediately above the godown, where there is dense indigofera scrub	3 to 7 as a rule	5 to 10 ...	Very good as a rule; for deodár and rai 6; only a few seedlings in the indigofera scrub	Fellings have taken place as in the preceding compartment. Rai should be rung in the few places where this is required in 1888, and the indigofera scrub might be thinned out in patches and young deodár planted Remaining exploitable trees to be felled in 1890.
		4	66	Steep rocky slopes at the top, but usually moderate elsewhere, facing west by south.	Ruling 25° with level patches here and there, precipitous at top of compartment.	9 266′ to 7,845′	On moderate slopes a deep sandy loam with a thick layer of humus, gneissic rock occasionally outcropping	A mixed forest of deodár, rai, and moru, the first named species predominating, with small open patches here and there, usually covered with indigofera scrub In the higher parts near the main ridge deodar becomes scarce, whilst karshu enters into the crop, there are some straight well, grown deodár but in open places they are branchy.	3 to 7 ...	3 to 7 ..	Advanced growth of deodár plentiful on ridges A very fair number of moru and deodár seedlings with some rai save in the indigofera scrub.	Selection fellings were made in 1876-78 Rai might be safely thinned out by ringing, as deodar shows every inclination to spread No planting up is required All exploitable trees to be felled in 1890
		5	73	Moderate slopes as a rule but rock outcropping here and there, especially in the chir forest. Aspect west by south.	Usually about 30.°	7,845′ to 7,000.′	Deep sandy clay with a thick layer of humus in the oak forest.	Near the bungalow some grassy slopes; elsewhere in the higher parts a forest of bán or moru, deodár and some kail with a few rai, maple, &c, in damp ravines. Burans and ayar pretty common; lower down there is a chir forest	Upper forest 8, chir forest 4.	6 to 10 ...	Of kail fairly good, of chir 2—6 only, a few deodar seedlings.	Selection fellings made in 1876. In the ravines very careful thinning might be made to encourage the deo-

								with a few scattered bán. Some fine deodár still remain and there are some fine well-grown chír in the lower parts.						dár, lopping being the safest plan as the least likely to cause slips. All exploitable trees to be felled in 1890.
	"	6	103	Very precipitous, grassy and rocky slopes; easier in upper part facing west and south.	45° to precipitous.	7,000′ to 4,160′	The bare gneissic rock constantly exposed, elsewhere soil very superficial.	Almost entirely a chír forest with numerous bán in the upper portion; also this species and other evergreens in ravines; large trees are not very numerous, but 2nd and 3rd class ones are common.	...		...	Excellent in most places where there is any soil; average 6.	The compartment is almost useless on account of the nature of the ground and nothing is required here.
III	Temple ...	1	52	Easy slopes, broken by two small ravines with small bits of precipitous ground; steep towards the main ridge. Aspect south-west.	25° to 35° ...	9,266′ to 7,845′	A deep subsoil of red clay, with rich dark loam humus above; rock gneiss and mica schist.	A deodár forest mixed with some moru and rai with an undergrowth of indigofera, desmodium and brambles; forest patchy with some open places.	Average 6,	5	to 10	4, but occasionally nil; advanced growth good in places.	All dry deodár were removed and a selection felling made in 1877-79. All exploitable trees to be felled in 1890; thinnings to be made in 1889.
	"	2	79	As above, but gentler slopes near the Temple. Facing west by south.	20° and over	9,200′ to 7,800′	Ditto ...	A deodár forest with some rai and a few broad-leaved species; indigofera abundant in the open patches.	5 ...	8	...	Rather better than in the preceding compartment.	Fellings made as in the preceding compartment. Further felling to take place in 1890 and thinnings in 1889. Blanks to be planted up after the fellings
	"	3	49	Precipitous immediately above the Temple, but elsewhere even and easily sloping ground, again becoming steeper in lower portion. Aspect westerly.	20° in easy parts.	9,200′ to 8,500′	Ditto ...	The ringing operations carried out in 1881 have been very successful, and a large number of 2nd, 3rd, and 4th class deodar cover the ground and have a very vigorous appearance. There are some older trees which might be extracted.	9 ... but in a few places not over 5.		...	Deficient owing to cover.	Fellings made in 1877-78; the remaining exploitable trees to be felled in 1890, and thinnings to be made in 1889. Blanks to be planted up after the fellings About 45 acres were thinned by ringing in 1881.

APPENDIX C.

Description of Compartments—(continued).

Number of block	Name of block.	Number of compartment.	Area in acres	Configuration.	Slope	Altitude	Soil	Stock.	Density.	Quality.	Reproduction.	Treatment.
				DEOTA FOREST—(*continued*).								
	Temple (contd.)	4	121	Lower and upper portions precipitous and rocky, but the central and largest part consists of even and easily sloping ground. Aspect west by south.	20°—30° as a rule	9,397′—7,800′	A deep subsoil of red clay with rich dark loam and humus above. Rock gneiss and mica schist	A mixture of deodár, rai and morinda, broad leaved species being almost entirely absent. The ringing operations to the south of the road appear to have been as successful as in the preceding compartment. Above the road deodar is scarce, and no ringing operations have in consequence been undertaken, undergrowth of senecio ferns, &c	8 to 10	...	Very little, and not required, owing to the number of fourth class trees	As in compartment 3; about 50 acres were thinned by ringing in 1882.
	"	5	64	In the upper and larger part of the compartment easily sloping ground broken by two or three ravines; the lower portion is rocky and precipitous. Aspect west by south	20°—35° and above, sometimes over 45° below	7,800′—6,500′	Fairly deep and moist clay with sandy bands in upper part, superficial in lower part on which mica schist occasionally outcropping	In the upper part a mixed forest of deodar ban and moru, sometimes one sometimes the other predominating, with a few rai in damp places. In the lower part, close to the lower Jaurasi road, an open forest of bán, a little burans and ayar with some chír and a few kail, the chir being more common below the road, the deodár and kail less s; grass plentiful on exposed slopes	In upper part 6 to 8; in lower part 3.	In upper part 8 in lower 2 to 4	In upper part some young deodar 2, in lower 3 kail and chir gradually filling up the more open slopes.	As in compartment 3 but no ringing done.
IV.	Dopta ..	1	122	Very rocky and precipitous, especially above the road to Gokal. Lower down slopes more moderate, but interrupted by precipices. Aspects south and south-west	35°—40° and over.	10,000′—8,500.	Ridges nearly bare the gneiss rock being exposed; soil superficial elsewhere.	Above the Gokal road the slopes are usually bare with deodar only on the ridges, below there is a good forest of almost pure deodár mostly of the second and third class with a very few rai and morinda.	1 to 5 with blanks.	...	Advanced growth abundant in places, seedlings mainly on the ridges.	Selection fellings made in 1877-80. The great drawback to this compartment is its precipitous character which prevents heavy fellings, on ridges owing to breakages and in ravines owing to the washing of the soil that may follow. Any exploit-

												able trees which it is possible to cut to be felled in 1891.
"	2	112	Precipitous, with frequent scarps west of the Gokal road, whilst to the east the slopes are more moderate. Aspect south.	30°—40° and over.	10,355′ to 9,500′	Rocky in precipitous portions; on the more moderate slopes soil deep and richer.	Mainly a well-stocked karshu forest with a few yew, &c., and stunted deodár running high up the ridge, whilst there are also a few scattered rai and morinda. Undergrowth of ringál.	7 to 10 ...	...	Good for karshu ...	Sheep, &c., from Pingal patti and Koti gád may be allowed to graze in the upper portion as hitherto. Selection fellings made in 1881.
"	3	46	A series of precipices facing south.	50° and over.	10,000′ to 9,000′.	Nearly always absent, the gneissic rock appearing almost everywhere.	Scattered deodár wherever there is a little soil for it to grow in between the rock masses, with a little grass in crevices.	...	...	Good ...	It will probably be impossible to do anything here.
Katatách ...	1	92	Very rocky and precipitous ground, save a small corner in the north-west near the T. G. station facing east and south-west.	35° in north-west; elsewhere much above	7,337′ to 4,600′	Usually superficial, the rock being constantly exposed.	In the north-west corner a mixed forest of bán, burans, áyar and kail with a few scattered chír and one or two deodár; elsewhere a chír forest, the trees being scattered owing to the precipitous nature of the ground.	In north-west corner 5, elsewhere, 2 to 3.	...	Very good for chír where there is any soil.	Nearly an useless compartment, and no improvement can be effected.
"	2	46	Steep grassy slopes interspersed with masses of rock and small precipices facing east.	35° to 40.°	7,400′ to 6,500.′	Shallow as a rule.	Usually a mixed forest of kail, deodár and bán with a few chír; bán and kail predominate above the road, whilst chír and bán are numerous in the lower portion near the gád, where there are also a few scattered deodár.	7, but above the road only 5.	...	6; good for kail, deodár and chír.	Scarcely any exploitable trees in this compartment.
"	3	31	Very precipitous and rocky ground facing east.	Usually 45° or over.	7,500′ to 6,800′.	Superficial or absent; rock gneissic.	Usually a forest of deodár and kail, but below the lower road to Jauntasi chiefly kail, deodár, bán, burans and áyar, with only a few large deodár trees here and there, and those knotty; also a few chír.	5 ...	...	Excellent for kail and deodár, the seedlings of which completely cover the lower road.	Selection fellings made in 1883, and all remaining exploitable trees to be cut in 1891; thining to be made in the same year, but very little will be required.
"	4	47	Moderate slopes with some precipitous ground in the north-west corner facing east.	25°, but 45° and over in upper portion.	8,800′ to 7,500′	Fairly deep, containing a considerable proportion of vegetable mould.	A dense mixed forest of bán, moru, rai, deodar and kail. The deodár have straight, well-grown, symmetrical stems, free from knots.	7 to 9 ...	8 to 10 ...	Good in places where there is sufficient light, specially of kail.	Fellings made in 1882-83, save in the upper part of the compartment. More light is generally required, and some ringing should be done here in 1891, and all exploitable trees extracted.

APPENDIX C.

Description of Compartments—(continued).

Number of block.	Name of block.	No. of compartment.	Area in acres.	Configuration.	Slope.	Altitude.	Soil.	Stock.	Density.	Quality.	Reproduction.	Treatment.
	Katatách—(*continued.*)	5	164	Very precipitous and rocky, so much so as to be unworkable. Aspect south-east.	50° or over.	10,229′ to 7,800.′	Absent or superficial; rock gneissic.	A pure deodár forest, save in the highest parts, where some karshu is found. The deodár are branchy and badly grown, but they cannot be felled owing to the precipitous nature of the ground.	3 to 5 ...	2 to 5 ...	Deficient where it is possible to examine it.	Any exploitable trees which it is possible to cut to be worked out in 1891; a few trees were previously felled in 1882.
VI.	Jaurási ...	1	98	Rocky and precipitous especially in the extreme south. Aspects west and south-west.	Usually over 35°.	7,400′ to 4,600.′	Shallow, sandy loam or absent.	Over the greater part of the compartment a chír forest, but above the T. G. S. a mixed forest of bán, moru, deodár and kail.	Chír forest 2 to 3; mixed forest 6.	...	Chír 5 ..	The compartment is useless, and no improvement can be effected.
	" ...	2	49	Usually moderate slopes in the upper part, but precipitous and rocky lower down. Aspect south south-west.	...	7,500′ to 7,000.′	A shallow sandy loam with a little humus.	Open grassy slopes with scattered bán, kail, deodár and a few luráns and áyar; on the lower precipitous portion a forest of kail and bán with a few deodár and chír.	0 to 5 ...	...	Kail 3 ..	Scarcely any exploitable trees.
	" ...	3	77	Rocky and precipitous ground facing south.	35° and frequently over.	9,200′ to 7,200.′	Superficial or absent; rock gneissic.	Nothing but very scattered, knotty and much branched deodár, which are collected mainly on the ridges, the depressions between being covered only with grass.	...	...	Usually indifferent, but seedlings appearing in places.	Selection fellings were made in 1883, and the remaining exploitable trees should be worked out in 1891, if any can be found.
	" ...	4	104	Rocky and precipitous ground facing south-west.	Usually 40° or over.	9,500′ to 7,550.′	Ditto, but deeper in ravines.	Mainly pure deodár, the trees being knotty and with numerous low branches; some rai and karshu in the upper part.	4 ...	...	Patchy, from *nil* to 8.	Some of the rai in the upper part might be ringed in 1892. Selection fellings were made in 1883-84, and all remaining exploitable trees should be cut in 1891.

	"	5	123	Rocky and precipitous ground facing south-east.	Ditto	9,500′ to 7,550.	Ditto	Ditto, with moru and bán whilst some walnut, maple and horse chestnut are found near the main stream.	4	...	...	Ditto ...	A little ringing might be done in a few places in 1892. Selection fellings were made in 1885-86, and if any exploitable trees remain they should be cut in 1891, all blanks being subsequently planted up.
	"	6	113	Usually rocky and precipitous with some moderate slopes along the main ridge. Aspect south.	Ditto ...	10,229′ to 9,500.′	As in Katatách 5.	A few scattered deodár, but mainly karshu and rai.	...	...	...	...	Nothing can be done here.
VII.	Kánga ...	1	74	Precipitous with masses of loose rock. Aspect southerly.	Usually over 40°.	9,800′ to 7,550.′	Absent, or a superficial sandy loam with some humus.	A deodár forest with some rai and a very few morinda, moru and rhododendron; some karshu at the top, and some horse-chestnut in the gorge.	5 to 8	...	...	Good ...	Rai may be ringed in places in 1893. A selection felling was made in 1886.
	"	2	86	Short, moderate slopes separated by precipitous ground facing south-east.	25° to 40° and over.	10,469′ to 9,800.′	As in Katatách 5.	A few scattered deodár, but mainly karshu with some rai and morinda.	...	...	...	...	Selection fellings made in 1886-87. Thinnings to be undertaken in 1893.
	"	3	68	As in Kánga 1 in upper part, and in lower part as in Kánga 4.	Ditto ...	10,000′ to 8,000.	As in Kánga 1 and 4.	As in Kánga 1 and 4 ...	...	...	...	...	A few trees felled in 1887; selection fellings to be completed in 1888, and thinning made in 1893.
	"	4	64	Moderate even slopes, but rocky and steeper near the gád.	25° to 35° ...	8,200′ to 7,350.′	A deep sandy loam with a good layer of humus.	A mixed forest of rai, deodár and some morinda and kail; the third and fourth class deodár are numerous, well-grown, tall, straight and free from branches.	7 to 10 ...	7 to 10 ...	Deficient owing to the dense cover.		Selection fellings to be made in 1888, and thinnings in 1893. Some ringing was carried out in 1886, about 20 acres being gone over.
	"	5	31	Rocky and precipitious ground save in the upper north-west corner. Aspect east by south-east.	35 to 40° ...	7,800′ to 6,500.′	A shallow sandy loam, absent on some of the more precipitous parts.	In the uppermost part a forest of deodár, rai and kail as in Kánga 4, then grassy slopes containing a few young kail and a bán oak or two, whilst below the Kimari road the species are bán and chír with a few kail and scattered deodár.	0 to 7; average 4 or 5.	4 ..	6. especially good of kail.		Little in the way of improvement can be effected, save ringing in the upper part, which should be done in 1893. Selection fellings to be made in 1888.

C.

Description of Compartments—(continued)

Number of block	Name of block.	Number of compartment	Area in acres.	Configuration.	Slope.	Altitude.	Soil.	Stock.	Density.	Quality.	Reproduction.	Treatment.
VII	Patángui ...	1	118	Rocky, precipitous ridges and slopes with well-defined equally precipitous gorges. Aspect southerly.	40° ...	8,000′ to 6,500′.	A shallow sandy loam, absent on some of the more precipitous parts.	Just below the upper road grassy slopes with a few scattered young kail and some large deodár on the ridges; lower down a deodár and kail forest, whilst the greater part of the compartment, including all below the Kimári road and a portion above, contains chir mixed with a few bán.	Variable; 5 to 7 in the deodár portion.	3 to 4 ...	Very indifferent ...	A poor, steep compartment, where slow natural reproduction is the only improvement to be hoped for; selection fellings to be made in 1888.
	" ...	2	157	Rocky and precipitous above the road, and similar, but less steep ground below. Aspect south-easterly.	40° and over.	9,800′ to 7,600′.	A sandy loam, often absent, the bare gneiss being exposed.	Virtually a pure deodár forest with just a very few scattered rai, kail and oak. The large trees are somewhat too branchy and above the road they are stunted; trees of the third and fourth classes are numerous, and the advanced growth is very abundant in patches. Undergrowth of grass only.	5 to 8 ...	3 to 10 ...	Very variable; 0 to 10.	Selection fellings to be made in 1888, no cultural operations required.
	" ...	3	218	Steep rocky slopes in the upper part, and lower down long even slopes, the whole facing east and north-east.	From 20° to 30° to 40° and over.	9,573′ to 7,600′.	A deep sandy loam with humus, save on the more precipitous parts where the soil is often absent.	Just below Chakora tiba a forest of karshu, rai and a few deodár; elsewhere below Chakora dhár a fine deodár forest mixed with karshu and a few rai. The deodár are rather branchy, but with straight stems. Lower down on the more moderate slopes close to the Kimári road there is a mixed forest of broadleaved species, such as moru, soom, holly, &c., with some splendid deodár, a few kail and a dense undergrowth of desmodium, indigofera, myrsine, &c., with advanced growth of deodár and kail.	In upper parts 6 to 7; in lower 9 to 10.	4 to 10 ...	Near the main ridge often magnificent for deodar, the seedlings forming a dense thicket; there are also a few kail, rai, and morinda and numerous karshu seedlings; elsewhere deficient owing to the dense cover.	Ringing operations are needed, especially on the moderate slopes, and should be carried out in 1888 and again in 1894, and planting must be resorted to in places after felling the large trees in 1889.
	" ...	4	79	Long, unbroken, moderate slopes with occasional massive outcrops of rock, precipitous only immedi-	20° to 30°; not often above 25°.	8,000′ to 7,000′.	A deep sandy loam with much humus.	A bán oak forest with some magnificent deodár and some kail; in the lower parts bán, with buráns and áyar, predominate, whilst there are also a few	6 to 10 ...	7 to 10 ...	8 to 10; magnificent for deodár and kail.	Some ringing was done here in 1886 and the compartment should be

				ately over the gad. Aspect northerly.				chír. In the upper part there is a dense shrubby undergrowth of desmodium, indigotera, myrsine, &c., with advanced growth of deodár and kail.					gone over again in 1894; selection fellings will be made in 1889.
	"		5	121	Steep, rocky ridges and gorges, facing east and south-east, with moderate slopes adjoining compartment 4.	50° to precipitous	7,070′ to 4,160′.	A poor and shallow sandy loam	Chír with some bán in gorges ...	...	...	...	The compartment is too precipitous to be of any use.
IX.	Kimári ...		1	122	Mostly rocky and precipitous ground, facing east.	40° and above	9,437′ to 8,000′.	Poor, shallow and sandy save in depression.	Consists of deodár and bán with buráns, áyar, kail and a few chír near the Kimari road, the trees being most numerous in gorges and the cover being interrupted by numerous open grassy patches.	0 to 6; average 4.	3 to 5	6; very good for kail and deodár; the open grassy patches are being rapidly filled up with seedlings.	Selection fellings to be made in 1889 and thinning in 1895, if any be required.
	"		2	71	Open moderate slopes with some rocky and precipitous ground in the upper portion. Aspect easterly	Usually 25°	8,000′ to 7,500′.	A fairly deep clayey loam with a good layer of humus.	Deodár, with bán, buráns and áyar, predominates near the Kimari road, and there is a thick undergrowth of indigofera, desmodium, &c. with a good deal of advanced growth of deodár; to the south, near the outer fire line, there is mainly a stock of bán, buráns and áyar, with some advanced growth of these species and of kail, as well as a very few young deodar.	5 to 8	4 to 8	2	Selection fellings in 1889. Thinning in 1889, and again in 1895.
			3	227	Rocky and precipitous ground, save near the Jakoni dhár facing south east.	40° and above	7,500′ to 4,160′.	Shallow	Principally chir ..	...	...	...	Nothing required.
X.	Bhagiár ...	...		561		...	7,600′ to 3,560′.	...	Has not been divided into compartments	...	...	...	Can only be utilised in providing chír timber for slide and some fancy woods from the valley.
								BAMSU FOREST.					
I.	Pipal ...		1	450	Usually rocky and somewhat precipitous, especially bordering on the gad and its main tributaries. Aspect south-west.	35° to precipitous.	9,500′ to 6,700′.	The gneissic rock is constantly laid bare, and elsewhere the soil is usually superficial.	Over the greater part of the compartment a fairly good forest of deodár with kail, a little morinda and a few broad-leaved species, such as moru especially near the gad; whilst along the bed of the stream are to be found birch, horse-chestnut, a few walnut and other broad-leaved species. Near Pipal 4 the rocky, precipitous slopes are usually only covered with grass with here and there, especially on ridges, clumps of deodár and kail with a few scattered bán, there being a denser forest in the ravines.	6 to 9, but less near Pipal 4.	6	Indifferent, but on the grassy slopes 5, there being numerous young kail with some deodár.	Selection fellings in 1894 Thinning in 1889 and 1898.

APPENDIX C.

Description of Compartment—(continued.)

Number of block.	Name of block.	Number of compartment.	Area in acres.	Configuration.	Slope.	Altitude.	Soil.	Stock.	Density.	Quantity.	Reproduction.	Treatment.
				BAMSU FOREST—(*concluded*).								
I.	Pipal ...	2	134	Very rocky and precipitous along streams, with some moderate slopes near ridges. Aspect south-west.	35° to precipitous.	9,500′ to 8,600′	The gneissic rock is constantly laid bare, and elsewhere the soil is usually superficial.	As in the preceding compartment, but deodar is scarcer.	6 to 9	6	Indifferent ...	Selection fellings in 1894. Thinnings in 1889 and 1898.
	" ...	3	897	Very rocky and precipitous in places, but some considerable areas with gentler slopes, *e.g.*, Dundia Thách. Aspect southerly.	Ditto ...	10,421′ to 9,200′.	Ditto ...	Karshu, rai and morinda with a few scattered deodár.	Ditto ...	Ditto ...	Ditto ...	Ditto.
	" ...	4	127	Moderate slopes facing south and west; whilst near the rest-house at Asno are some old terraces, some of which have been re-cultivated.	30° to 35°	8,500′ to 6,700′.	Fairly deep on the terraces only.	Grassy slopes with scattered deodár and kail, and a few small bán, buráns and áyar.	...	...	2, chiefly of kail ...	Ditto, and 50 acres consisting of grassy slopes near the bungalow to be planted up in 1895.
II.	Dhikuri ...	1	269	All workable, but precipitous ground pretty common. Aspect north-easterly.	35° to precipitous	9,266′ to 6,567′.	Fairly good soil in ravines with a good layer of humus; elsewhere somewhat superficial.	A dense forest of deodár, rai, morinda and some kail. In some damp places rai predominates and girdling operations to encourage the deodár might be undertaken. Deodár is especially abundant on dhárs and other places which receive most light, fine, tall, straight trees being numerous. There are one or two cypress here and there and a few bán and moru in places.	7 to 9	4 to 10	Not much advanced growth or many seedlings owing to the dense cover, and what exists is mainly morinda with a little deodar on the ridges.	Selection felling in 1882. Thinnings in 1888 and 1897.
	" ...	2	314	As above, but rather more rocky and precipitous, especially in the upper portion north of the Udiári gád, where a good deal of the ground is unworka-	Ditto ...	10,200′ to 7,500′.	Ditto ...	As in the preceding compartment; there are some very fine deodár.	7 to 9 but less on the more precipitous portions,	4 to 10	Very scanty probably due to the density of the cover.	Selection fellings in 1893. Thinnings in 1889 and 1897.

				ble owing to precipices. Aspect north-easterly.									
	" ...	3	118	Precipitous ground accompanied by some moderate slopes as Adwantu Tach. Aspect north-easterly.	Ditto ..	10 355′ to 8,811′.	Ditto ...	Mainly karshu with some rai and a few scattered deodar.	...	...	...	Ditto.
III	Bamsu ...	1	264	Moderate slopes with rock not often exposed save on south easterly aspect Main aspect easterly, minor aspects south-east north east and north-west.	Not often over 35°	9,124′ to 7,564′.	Shallow loam or absent on the ridges to deep in the ravines, rock gneissic.	In the higher parts a good deodár forest sometimes almost pure, but usually mixed with kail, bán and moru, or an occasional rai or morinda. The deodár are very tall, straight and well grown with clean stems, save on the borders of blanks, where they are knotty and occasionally misshapen Near the fire line, on the long slope coming down from the Binai dhar there is open grassy and somewhat rocky ground with scattered chir, kail and ban, elsewhere near the fire-line there is a fair mixed forest of bán, kail and some deodar.	7 in higher part with frequent blanks; 6 in lower portion.	3 to 10	Generally good in open places especialy for kail 7, whilst deodar seedlings are also pretty common.	Selection fellings in 1892 Thinnings in 1888 and 1896
	" ...	2	198	Pretty steep ground, but precipitous only near streams. Aspect easterly.	30° to 45° ...	9,134′ to 6,500′.	Ditto ..	Very variable, as in Bamsu 1 near that compartment above the upper road; elsewhere the upper portion is very open as a rule, consisting of some deodar, kail and rai, with extensive open grassy slopes; lower down there is a mixed forest of deodár and kail with a little rai, very few broad leaved species and occasional blanks Slopes facing south are usually open and grassy.	2 in open upper part 5 to 7 in lower portion.	8	3, the slopes facing south are gradually filling up with seedlings, especially of kail with a few deodár, and some chir seedlings in lowest parts.	Ditto.
	" ...	3	93	Very rocky and precipitous ground facing south	Usually over 40°	8,827′ to 7,618′.	Absent or very superficial.	Rather bare open slopes containing scattered deodar, kail, and ban the latter being abundant to the west, and the deodar being knotty and badly grown In the lower part there are patches of deodar with one or two kail interrupted by grassy slopes To the west the stock consists mainly of bán, burans and ayar with a few chir.	1	2	Slight ..	Ditto.
	" ..	4	155	Rocky and precipitous north of the Shikar gad, but less so to the south Aspect east-north east	35° to 45° and above	8,000′ to 5,700′.	Ditto, but deeper and moister south of the Shikár gad.	North of the Shikar gád there is a very open forest of scattered kail, chir, a few ban and deodar, the trees principally congregating on the short slopes facing north, whilst the others are bare South of the gad the slopes are better covered with kail, ban, some chir and a few deodár.	North of the Shikar gad 1, south of the gad 5.	3	North of the gád a few kail and chir seedlings, south of the gád seedlings more abundant, 2	Ditto.

APPENDIX C.

Description of Compartments—(continued).

No. of block.	Name of block.	Number of compartment.	Area in acres.	Configuration.	Slope.	Altitude.	Soil.	Stock.	Density.	Quality.	Reproduction.	Treatment.
						SARÁS FOREST.						
I.	Dumráli ...	1	182	Moderately even slopes, but precipitous below Shailar Thach and in ravines. Aspects northerly and easterly.	30° to 40° ...	9,300′ to 6,949′.	A deep moist loam on the less precipitous parts.	The lower part is well stocked with rai, deodár, kail, some morinda and bán, the deodár predominating on the upper rocky part and on the ridges.	In lower part, 8, upper part less.	7	4	Selection fellings in 1895. Thinnings in 1890 and 1899.
	" ...	2	222	As in the preceding compartment. Aspect north-easterly.	Ditto	9,300′ to 7,100′.	Ditto ...	A forest of rai, deodár and morinda, the proportion of rai and morinda being considerable There are very few oaks or other broad leaved species, and these are found chiefly near the gád	7 to 9	7	Indifferent, probably due to the density of the cover.	Selection fellings in 1896. Thinnings in 1890 and 1899.
	" ...	3	103	Moderate but rocky slopes facing south, precipitous in places near the gád.	...	9,300′ to 6,949′.	Sandy and somewhat superficial save at the bottom of the valley; rock quartzite and gneiss.	In the western and lower portion chiefly bán with some kail and a few deodár; higher up deodar and rai with a few kail; open places numerous.	0 to 6	3 to 8	Seedlings not numerous, consisting of kail and a few deodar.	Selection fellings in 1896. Thinnings in 1890 and 1899.
	" ...	4	157	Steepish slopes near the main ridges, facing north-east and east.	35° to 45° ...	10,421′ to 9,300′.	As in Dumráli.	Almost entirely rai and morinda with a few deodár on the ridges, and some karshu along the main ridge.	7 to 9	3 to 6	Deficient ...	Selection fellings in 1896. Thinnings in 1890 and 1899.
II	Kánda ..	1	160	Steep somewhat rocky slopes, but easier in the southern corner. Aspects east and north-east.	35° to 45° ..	9,129′ to 7,400′.	Superficial loam with underlying rock of gneiss or mica schist.	In the south-east a fair forest of deodár, rai and scattered kail, with a little moru and bán; in the north-west open grassy slopes, with here and there small clumps of trees, rai, deodár, kail bán, buráns and ayar, and these also scattered in small numbers over the otherwise bare slopes. Indigofera scrub in places.	In south-east portion 7.	2 to 5	Some seedlings are usually to be found on the grassy slopes, principally kail, with here and there a young deodár or ban.	Selection fellings in 1895. Thinnings in 1898 and 1899.
	" ...	2	190	Steepish ground with occasional moderate or precipitous slopes facing east.	35° to 40°...	10,000′ to 7,805′.	Ditto ...	A forest of rai, deodár and some kail, with a few broad-leaved species, bán, moru, buráns, áyar, &c., with occasional open places.	7	6	In open places there are numerous kail seedlings with a few deodár, elsewhere a few young rai and deodár.	Ditto.

KOTIGÁD FOREST.

I.	Bálcha ...	1	300	Moderate, even slopes, occasionally steep near ravines and more broken in the upper eastern half. Aspect northerly.	20° to 35°	9,562′ to 7,350′.	A deep rich loam with good leaf-mould in parts.	A very good and dense forest of rai and morinda with some deodár especially on ridges, and a few kail here and there. There are some broad-leaved species, such as oaks walnut, horse-chestnut, &c, near streams, and some karshu along the main ridges.	9 to 0	7 to 10	Seedlings scarce owing to the dense cover.	Thinnings in 1901.
	" ...	2	180	As above, but the slopes near the main ridge are moderate Main aspect northerly, with minor aspects north-east and south-west.	20° to 35°	9,500′ to 7,300′,	As above, but superficial on the south-westerly slopes to the east of the Shalu gád.	In the lower part west of the gád deodár and ban with a few kail and rai, whilst east of the gád deodár forms the greater part of the stock associated with a few bán and kail. In the upper part a similar forest to that of Balcha I.	8 to 10, but 6 only in the lower part east of the gád.	5 to 10	...	Ditto.
II	Muráli ...	1	154	Steep ground facing west,	35° to 40°	9,235′ to 7,500′.	Superficial.	An open forest of ban with a few kail, whilst towards the upper boundary there is a fair proportion of deodár; open grassy patches are common.	0 to 7, average 3.	...	In upper part, of kail 3 to 8; in lower part very scarce	Thinnings in 1903.
	" ..	2	148	Rather moderate slopes steepest near the Shálu-gád, and the Shálu dhár Aspects west and north-west.	30° to 35°	9 562′ to 8,000′.	A fairly deep loam with an occasional outcropping of rock.	A forest of karshu above with a mixture of rai and kail and some deodar which becomes more plentiful lower down. Bordering the gad oaks and other broad-leaved species are common; there is a large blank near Mutachi dhar with only a tree here and there.	Average 6 ...	...	Variable; in the blanks near Mutách dhár a few scattered young kail and deodar.	Ditto.
	" ...	3	145	Steep ground occasionally precipitous near the gád. Aspects north-west and north east.	30° to 40° sometimes more.	9,300′ to 8,500′.	A fairly deep moist loam with a good layer of humus.	In the higher parts a dense forest of rai morinda and karshu with very few deodar; lower down rai, morinda and deodár the latter mixing in freely on the lowest slopes.	8 to 10	...	...	Ditto.
	" ...	4	220	Moderate slopes facing the north east and only rarely precipitous in ravines.	35° not often above.	9,400′ to 7,500′.	Ditto ...	In the upper part where the slopes are the most moderate, the forest consists entirely of rai and morinda with a little karshu, whilst lower down deodár mixes in becoming common on ridges; there is also a little kail and broad-leaved species are common along the gád.	9 to 10	...	Scarce probably owing to the dense cover.	Ditto.
	" ...	5	175	Moderate slopes facing the north.	25° to 35°	9 010′ to 7,500′.	Ditto ..	Slopes often only covered with grass or containing a few scattered kail and bán, but in ravines and towards the Muráli gád there is a forest of kail, bán and a few scattered rai and deodár.	0 to 6	3 to 6	Of kail excellent seedlings coming up in large patches on the open slopes, but, doubtless owing to the absence of seed bearers, deodár seedlings are usually absent	Thninings in 1903; 160 acres of open slopes containing young kail to be sown and planted up with deodár in 1892-95.

APPENDX C.

Description of Compartments—(continued).

No. of block.	Name of block.	Number of compartment.	Area in acres	Configuration.	Slope.	Altitude.	Soil.	Stock.	Density.	Quality.	Reproduction.	Treatment.
						KOTIGÁD FOREST—(continued.)						
	Murali (*concld.*)	6	202	Moderate slopes just below the main ridge facing north.	25° to 35°	10,421′ to 8,982′.	A fairly deep clayey loam with some vegetable mould.	In the western part karshu with rai and kail; in the eastern half generally an open forest, the openness very probably caused by fires, as there was formerly a large tách in the compartment, and there are now chiefly young trees of raí, morinda, kail and karshu with a little deodár.	In the west 8 to 10; in the east 3.	...	In the eastern open part, the ground promises to be covered in time with seedlings of all the species mentioned under stock, and which are already pretty abundant, especially kail.	Thinnings in 1903
III	Ola ...	1	103	Steep ground facing west.	35° to 40°	9,400′ to 7,140′.	Superficial ...	Open grassy slopes with a scattered forest of deodár, kail and a few rai and karshu or other oaks. The deodár are very branchy, and there are but few of the younger classes.	0 to 3	3	Unsatisfactory; a few kail only are coming up on the open slopes.	Thinnings in 1904
	" ...	2	202	Steep, rugged ground facing west.	35° to 40°	9,400′ to 7,140′.	Ditto ...	A mixed forest of deodár, rai and kail, these species occurring in about equal numbers together with a few morinda.	8 to 10	...	Slight owing to the dense cover.	Ditto.
	" ...	3	272	Moderate slopes below the ridge, but precipitous and rocky for some distance from the Murali gád. Aspects north and north-east.	...	9,400′ to 7,140′.	A fairly deep clayey loam.	A forest of rai, morinda and deodár with a few kail; young trees are numerous especially fourth class ones, chiefly rai with deodár on the ridges. Near the fire-line there are some broad-leaved species together with some very fine rai, but deodár is very rare.	8 to 10	...	Slight owing to the dense cover.	Thinnings in 1904.
	" ...	4	187	Rocky and precipitous in the upper basin of the Doda khud, elsewhere steep slopes, the whole facing west.	35° to 40° and over.	9,400′ to 6,814′.	Superficial ...	In the upper part a dense forest of rai and morinda with scattered deodár a few kail and moru with some open fern covered patches. Lower down a mixture of deodár kail, raí, moru and pán.	8 to 10 above, 5 to 7 below.	...	Above, the few open patches are being filled up with raí and kail seedlings, whilst on similar patches lower down the reproduction of kail is very good, and there are also	Thinnings in 1904. 50 acres of open slopes containing young kail to be sown or planted up with deodár in 1897.

												a few deodár seedlings, some of which need more light.	
	"	...	5	432	Moderate slopes intersected by numerous small ravines, occasionally precipitous, bordering on the larger streams. Aspects north-west and north-east.	20° to 35° ...	9,200′ to 6,814′.	A fairly deep clayey loam with a good layer of humus in places.	On the slopes facing the Doda gád with north-easterly aspect there is a mixed forest of deodár, rai and kail, the rai being abundant in the upper part, the kail being pretty common lower down whilst in the vicinity of the same gád and close to the fire-line moru is common in addition to the three species mentioned above, whilst further east there is an open forest of bán and kail with some buráns, áyar, and scattered deodar. There is a similar forest on the upper slopes of the large stream west of the Doda gád where the proportion of young trees is very large Elsewhere immediately above the fire-line and in the west, running up as far as the pillar on the Roa dhár at an elevation of 8,800 feet, there are moderate fern-clad slopes, the fern being more or less mixed with grass and occasionally with a little indigofera, on which there are some old and scattered kail.	7 to 10 in upper basin of the Doda gád, and of the large stream to the west; 4 to 6 in the bán and kail in forest; 0 to 5 elsewhere.	...	In the open ferny patches on the slopes facing the Doda Gád a few kail are coming up. In the bán and kail forest also the seedlings are chiefly kail on the open fern-clad slopes; elsewhere, kail seedlings a few years old are to be seen almost everywhere just pushing their heads up through the fern, but owing to the absence of seed-bearers there are no young deodár.	Thinnings in 1904; 200 acres of open slopes containing young kail or scattered bán and kail trees to be sown or planted up with deodár in 1898 and 1902.
	"	...	6	309	Rather steep slopes cut up by numerous tributaries of the Maoldi gad. Aspects north and north-west with minor slopes facing north-east, north-west and south-west.	As a rule about 35°.	9,000′ to 7,674′.	Ditto ..	Scattered old deodár and kail or those trees in clumps with open slopes between them. Rai mixes in towards the upper boundary where the forest becomes denser. There are scarcely any broad-leaved species, save one or two oaks On the slopes facing north west and adjoining compartment 5, there is grass with a little fern, some scattered old kail trees, and one or two deodár, rai and moru.	5 to 8 in upper part; elsewhere 0 to 4.	...	On north-easterly slopes 5 for kail and deodár; on the open slopes near compartment 5 the young kail are coming up freely, whilst there are also some deodár seedlings in the vicinity of the few seed-bearers of that species.	Thinnings in 1904; 100 acres of similar slopes to those in compartment 5 to be sown or planed up with deodar in 1903 to 1905.
	"	...	7	939	Slopes of variable inclination just below the main Lambatách ridge and facing north	...	10,538′ to 9,000′.	...	Nearly entirely karshu, rai and morinda, with very few scattered deodár in places.	...	...	...	Nothing required here.
IV.	Gokal	...	1	341	Consists of the basin of the Salkáni gád and the upper western part of the basin of the Innádi gád, mostly facing south-east, with one slope to the north-west.	...	10,406′ to 7,600′.	Superficial and without humus or absent.	Much branched deodár with a few kail and rai, but no broad-leaved species worth mentioning, except karshu in the highest parts. Grassy blanks are common, and many trees have been killed by fires.	3	3 to 5	*Nil*, probably due to the frequency of fires.	Thinnings in 1901.

APPENDIX C.

Description of Compartments—(continued).

Number of Block	Name of Block	Number of Compartment	Area in acres	Configuration	Slope	Altitude	Soil.	Stock.	Density.	Quality.	Reproduction.	Treatment.
				KOTGÁD FOREST—(*concluded*)								
	Gokal (*concld*)	2	281	The upper and northern part of the basin of the gád passing by Bitla Bál cha, rocky and precipitous in the upper portion with occasional moderate slopes lower down General aspect south westerly with minor slopes facing north-east and south west.	Usually over 40°, but very variable.	10,436′ to 7,800′.	Superficial or on the moderate slopes a good loam with plenty of humus.	Chiefly of deodár, there being some very fine trees occasionally attaining a girth of 25 feet There are also some rai and a few walnut with numerous undershrubs; blanks are few.	As a rule 10	8 to 9	4 fires apparently rare	Thinnings in 1901
	,, ...	3	304	The southern part of the basin of the above gad, slopes moderate save near the top of the ridge where the ground is rocky and often precipitous General aspect north-westerly	From 20° to 30° in lower part, to 30° and over near the ridge	17,400′ to 4 000′	Excellent with plenty of humus except near the ridge.	Well stocked with rai morinda and deodár, the latter being well grown and of good quality A few broad-leaved species, such as maple walnut, &c, also occur, whilst on the higher parts karshu is found scattered amongst the conifers; in the extreme west there is a mixed forest of kail, deodar, ban, and some ayar, &c	9, in mixed forest 7.	8	Of deodár 2 The seedlings are often somewhat suppressed, and the density of the forest no doubt checks reproduction Morinda seedlings are the commonest	Ditto.
	,, ...	4	182	Comprised between the Sandedhar and the Samsu fire-line being only rocky and precipitous near the ridge. Aspect westerly.	20° save near the ridge.	10,031′ to 8,200′.	Ditto ..	Chiefly rai with some deodar a few morinda and kail with a little moru and maple, there is some karshu along the ridge, and here the deodar is much branched	7	9 in lower portion, 3 in higher	Chiefly of rai, for deodár 1.	Ditto
				CHANSIL FOREST								
I.	Duchanu ...	...	-	Not divided into compartments.					...	...	...	Nothing required but perhaps a little thinning may be wanted in 1903.
II.	Jagta ...	1	320	Very rocky, precipitous and often inaccessible. Aspect southerly.	Generally over 40°	...	Superficial or more often absent.	Chiefly deodar, rai being also common in the upper part. The trees are much branched, and only a small portion of them on the less precipitous ground can be worked out.	Very variable, 1 to 7 with occasional blanks	3 to 4	Usually *nil* ...	Ditto.

		...	2	220	Very rocky and precipitous, but workable in parts. Aspect southerly.	Ditto.	...	Superficial or more often absent, but a good loam with humus in places.	In the upper part a forest of deodár, sometimes pure sometimes mixed with rai, and a few kail lower down, whilst near the outer boundary the stock is mainly composed of bán and burans; many trees have been damaged by fire.	Very variable, 1 to 10, with numerous blanks.	...	Often *nil*, but in places of deodár 3; there are some kail seedlings in the middle portion	Ditto.
III	Dedragad	...	1	110	Fairly even ground with pretty regular slopes Aspect north-westerly.	30°	...	Good, with plenty of humus and immediately covered with undershrubs, &c	A forest of morinda and rai with a few bán, kail and deodár, but most of the best deodár have been already worked out.	9	...	The young uncounted deodár are numerous.	Thinnings in 1903 selection felling was made in 1881, and dry trees were cut up in 1887.
	"	...	2	210	Precipitous, rocky and often inaccessible.	35° to 55°	...	...	An open and indifferent forest of deodár, kail and rai, the deodár being very branchy.	4 with numerous grassy blanks.	4	3 to 4 for kail and deodár.	Nothing to be done.
	"	...	3	200	Pretty evenly sloping ground on the right bank of the Bhujutty gád. Aspect north-westerly.	25° to 30°	...	...	Except near the ridge a complete stock of rai, morinda, kail and deodár, with some moru, &c; all the best deodár have been felled.	Usually 10..	5	Of deodár 1, morinda 7.	Thinnings in 1903; selection felling made in 1831; dry trees cut up in 1887.
	"	...	4	145	Rocky and precipitous ground on the left bank of the Bhujutty gad Aspect south-easterly.	40° to 50°	...	Superficial ..	An open forest of deodár and kail with some bán and burans in the lower part, and a forest of morinda and karshu above.	4	4	Very few seedlings perhaps owing to fires.	Ditto.
	"	...	5	160	Pretty even slopes on the right bank of the Suráry gád. Aspect north-westerly.	25° to 35°	...	A good loam with plenty of humus	Morinda, rai and moru, with kail and deodar on the ridges All large well-grown deodár have been cut out.	8 with occasional blanks.	...	Deodár seedlings are only found near the ridge, whilst young kail are common in the blanks.	Ditto.
	"	...	6	300	Very rocky and precipitous ground, comprising the left bank of the Suráry gad, and some slopes to the north draining directly into the Dedra gád. Some portions almost inaccessible. Aspects southerly and easterly.	40° to 50° or above.	...	Superficial or absent with gneissic rock exposed.	An open forest of scattered deodar. bán, and buráns with a few kail; the deodar are much branched.	3 with numerous blanks.	4	Of deodár 2, but often almost *nil*.	Nothing to be done.
	"	...	7	135	Pretty even slopes forming the right bank of the Seral gád.	30°	...	As in compartment 5.	A complete stock of morinda and rai, some moru, kail and deodar in the lower parts, with karshu along the top of the ridge and generally an undergrowth of yew.	10	7	There are only morinda seedlings, which is probably owing to the dense shade.	Thinnings in 1903 if there are any deodár which then demand it.

APPENDIX C.

Description of Compartments—(continued).

Number of block.	Name of block	No. of compartment.	Area in acres.	Configuration.	Slope.	Altitude.	Soil.	Stock.	Density.	Quality.	Reproduction.	Treatment.
				CHANSIL FOREST—(*continued*).								
	Dedragád ...	8	120	Consists of the upper part of the left bank of the Galtai gád. Aspect westerly.	...	...	...	Has not been valued, as the stock is mainly composed of karshu.	...	...	...	To be used as a grazing ground.
	" ..	9	410	Consists of the lower part of the left bank of the Galtai gád, the slopes being fairly even Aspect westerly.	25° to 40°.	..	A good loam with plenty of humus, the gneissic rock being exposed in places.	A dense forest of morinda rai and karshu with some deodár and moru; kail occurs on the lower ridges and karshu on the high ridge, separating the Galtai gád from the Andri gád.	9 to 10	6	Good reproduction of morinda, but scarcely any deodár seedlings.	Thinnings in 1903.
	" ...	10	565	A large, irregularly shaped compartment, one portion running into the Dedra gád, and a second directly into the Koti gád. Aspects south-west and south.	30° to 40°.	...	Superficial, the gneissic rock being frequently exposed. There is no humus.	A very open forest of scattered bán, moru deodár and kail. The deodar is very branchy and not many are of any use for sawing purposes. The compartment contains three chaks, and it appears generally to have been burnt for grazing purposes.	2	2	*Nil*	Nothing to be done
IV.	Andrigád ...	1	400	Rocky and precipitous ground with variable slopes, consisting of the lower western part of the basin of the Andri gád. General aspect easterly.	35° to precipitous, but usually over 35°.	...	Superficial or absent, the bare rock being exposed on the steepest parts; a good rich loam with plenty of humus in ravines and near the gád.	Chiefly deodár with some rai and kail, whilst in the vicinity of the gád the deodár is mixed with fewer rai and numerous moru. The deodár is much branched on the more precipitous ground, but in most places it is capable of attaining a large size, one tree being found to be 21 feet in girth and 170 feet high.	7	5 on precipices to 10 in ravines.	Almost *nil*	Selection felling made in 1884-1886. More trees to be felled in 1904 Thinnings in 1899.
	" ...	2	500	Not so rocky as the preceding compartment, precipices less common and slopes less variable, comprising that portion of the Andri gád block immediately above compartment 1. General aspect easterly.	35° to precipitous.	...	Ditto.	In the lower part a forest of deodár with a considerable proportion of rai, and a few kail and young morinda with moru near the gád; higher up morinda and rai become more abundant, whilst karshu and yew enter into the stock, the deodár being much less frequent; in fact, in the higher parts there is a forest of pure karshu. Ringáls are every where abundant.	9	8	Almost *nil* save in the lowest portions where it is 2, but the seedlings are often suppressed. There are also rai and morinda seedlings.	Ditto.

	"	...	3	560	Consists of the upper basin of the Andri gád.	...	...	...	A rai, morinda and karshu forest not valued.	...	...	...	Nothing to be done.
	"	...	4	425	Rocky and precipitous with very various slopes. General aspect westerly.	35° to precipitous usually over 35°	...	Ditto.	In the upper part rai and deodár, the former predominating with a little morinda; there are some broad-leaved species such as moru and maples near the gád, and in ravines. Lower down kail appears and deodár becomes common until it predominates, being nearly pure save for a few rai and kail; many of the deodár are much branched. Ringáls abound.	9	6	Almost *nil* in the upper part, but improving lower down until it reaches 6 for deodár in open places. There are seedlings also of rai and kail.	Selection felling made in 1884-1887, more trees to be felled in 1904. Thinnings in 1899.
V.	Boktáragád	...	1	175	Moderate slopes facing the Koti gád betwen the Andri and Boktára gád; General aspect southerly.	Moderate ...	...	Superficial, good only in places.	Has not been valued, as it contains a large extent of grass land regularly burnt for grazing purposes, whilst here and there are some scattered deodár and kail, bán oak occurring near the gád.	...	...	...	To be kept for grazing purposes.
	"	...	2	320	Ground often rocky and precipitous, a large area being, however, workable.	35° to precipitous.	...	...	In the lower portions a forest of deodár and rai with some morinda and a few kail, broad-leaved species, such as moru, horse-chestnut, maple and walnut, being common near the gád. Higher up the kail disappears, and the morinda becomes commoner as does also karshu.	8	...	Almost *nil*	Selection felling in 1904. Thinnings in 1899.
	"	...	3	840	The upper basin of the Boktara gád, rocky and precipitous.	...	...	...	Has not been valued, the stock consisting of karshu and firs.	...	...	...	Nothing to be done
	"	...	4	240	Very rocky and precipitous, and east of compartment 2, a part draining into the Boktára gád, and a part directly into the Koti gád; only a certain proportion of the compartment is workable General aspects southwesterly and southerly.	40° to precipitous. usually over 40°	...	Very superficial or absent, the bare gneissic rock being everywhere visible.	Chiefly rai and deodár with a few morinda and some broad-leaved species near the stream.	...	...	...	As in compartment 2.
VI.	Tára Mundal	...	1	2800	The upper basin of the Koti gád.	...	...	...	Has not been valued, being a forest of morinda, rai and karshu.	...	...	...	Nothing to be done.
	"	...	2	380	Rocky for some distance above the gád, precipices being common, but a considerable area is workable. General aspect northerly.	40° to precipitous.	...	Good and rich in humus save on the more precipitous ground.	A forest of deodár, rai and morinda and a few kail with moru near streams. Ringáls abundant.	7	...	Almost *nil* for deodar, but a fair number of rai and morinda seedlings.	Thinnings in 1902.

APPENDIX C.

Description of Compartments.—(continued).

Number of block.	Name of block.	Number of compartment.	Area in acres.	Configuration.	Slopes.	Altitude.	Soil.	Stock.	Density.	Quality.	Reproduction.	Treatment.
						CHÁNSIL FOREST—(*concluded*).						
	Tára Mundal ...	3	560	Moderate slopes opposite the Boktára gád between compartments 2 and 4. Aspect north-westerly.	Moderate as a rule.	...	...	Has not been valued, being a dense forest of rai and morinda with some moru, &c., and a few box trees of inferior quality near the gád.	...	...	...	Nothing required.
	" ...	4	310	Northern part of the basin of a tributary entering the Koti gád just above the mouth of the Andri gád. General aspects north-westerly and southerly.	30° to 45°; precipitous on southerly slopes.	...	Superficial on southern face or absent with bare gneissic rock outcropping; good and fairly deep soil elsewhere.	The southern face is stocked almost entirely with deodár, the remainder chiefly with rai and moru, but with a fair number of deodár.	Southern face 6; elsewhere 8 to 10.	...	...	Thinnings in 1902.
	" ...	5	240	The southern portion of the above basin. Aspect north-westerly.	30° to 45°	...	Good ...	Lower portion stocked with rai, moru, some morinda and a few deodár; upper part without deodár, containing karshu, &c.	...	...	...	Ditto.
VII.	Maunda ...	1	160	Rocky and precipitous Aspect southerly.	30° to precipitous.	...	Superficial or absent, the rock being exposed.	Numerous large well-grown deodár with some kail and rai; there is a karshu forest along the main ridge.	5 to 7	...	...	Ditto.
	" ...	2	400	Immediately above the village of Maunda with moderate slopes.	25° to 35°	...	Rich and moderately deep with a very thick layer of humus.	A thick forest of morinda and rai with some scattered young deodár; maples are pretty common, and there is an undergrowth of staphylea, ringáls, &c.	10	8	Of deodár *nil* ..	Ditto.
	" ...	3	340	East of compartment 2 ...	Moderate ...	...	Ditto ...	A thick forest of rai and morinda with a very few scattered young deodár.	10	...	Ditto ...	Ditto.
						SÁHLRA FOREST.						
I.	Moriru ...	1 to 4	...	Descriptions missing ...	...	...	...	...	...	...	...	Selection fellings in 1896 Thinnings in 1891 and 1900.
II.	Kángagád ...	1	345	The lower part of the southern basin of the Kangu gád with moderate or even gentle slopes facing north.	Usually 30°, but occasionally less.	...	Excellent loam and of fair depth; humus plentiful.	A dense forest of rai, morinda, moru, &c., with a very few scattered deodár, and these chiefly on ridges except high up and near the main stream where there are numerous young deodár.	10	8 to 10	Of deodár almost *nil*, of box wood 8.	Selection fellings in 1897; thinnings in 1892 and 1901.

								There are some box trees low down bordering on the gád.				
	" ...	2	150	The upper part of the above basin, with aspect in part northerly and in part south-easterly.	Seldom over 35°.	...	Excellent loam on northerly aspects; superficial elsewhere.	Near the gád there is a dense pole forest of fine young deodár, whilst higher up rai and morinda constitute the bulk of the stock with scattered young deodár; karshu occurs near the ridge.	10	10	Owing to most of the deodár being in the pole stage there are but few seedlings of this species.	Ditto.
	" ..	3	110	Precipitous, but for the most part workable slopes facing south and situated on the left bank of the Kánga gád.	Often over 40°.	...	Superficial or absent, no humus.	Almost pure deodár in the eastern part, whilst to the west deodár is also the principal tree mixed with some rai and a little kail. The deodár is usually much branched and many fine trees have been killed by fires. There is a little box in the lower part near the main stream.	5 to 6	5	Almost *nil*, probably due to fires.	Ditto.
	" ...	4	100	Consists of the slopes on the south bank of the Isteri gád facing north.	Moderate ...	...	Good ...	Principally rai, morinda and moru, but deodár is abundant in places, there being many fine trees. In one spot there is a very dense pole forest of young deodár. A few box trees are found near the gád where moru and soom abound. Ringáls are common.	10	8 to 10	...	Ditto.
	" ...	5	180	The upper basin of the Isteri gád. General aspects north-easterly and south-easterly.	Varying with the aspects from moderate to precipitous.	...	Ditto ...	Rai, morinda, karshu and very few deodár. Ringáls are plentiful.	10	...	Amost *nil* ...	Selection fellings in 1897. Thinnings in 1892 and 1902, but little required.
	"	6	430	The northern part of the basin of the Isteri gád. The slopes face south are generally inaccessible owing to precipices, but are workable in places.	Nearly always precipitous.	...	Very superficial or oftener absent, the bare rock being exposed.	Deodár is abundant in places mixed with a few kail.	Extremely variable.	...	...	Ditto.
III	Deotálgád ...	1	240	The lower part of the southern half of the basin of the Deotál gád facing north-east.	25° to 35° occasionally precipitous as in the south-west corner.	...	A good loam with plenty of humus.	The lower part is stocked with kail and deodár, the upper and larger portion with rai, moru, morinda, some fine but scattered deodár and a few kail; near the gád, there is chiefly moru and soom. Ringáls are abundant.	10	8 to 10	Deodár seedlings fairly numerous but frequently suppressed.	Selection fellings in 1897. Thinnings in 1893 and 1902.
	"	2	290	Situated between the two main tributaries of the Deotál gád on the south. General aspect northerly.	Moderate ...	...	Ditto ...	Rai, moru, karshu, morinda, with a very few deodár and kail; the forest is quite young in places. Ringáls are abundant.	10	...	Very slight owing to the dense cover.	Ditto.
	"	3	275	Situated between the main gád and its large tributary to the south.	30° to 35°	...	Moderately good but not deep.	A few fine deodár amongst the rai and other species as in the preceding compartment.	10	...	Ditto ...	Ditto.

APPENDIX C.

Description of Compartments—(continued).

Number of block.	Name of block.	Number of compartment.	Area in acres.	Configuration.	Slope.	Altitude.	Soil.	Stock.	Density.	Quality.	Reproduction.	Treatment.
						SAHLRA FOREST—(*continued*).						
III.	Deotálgád—(*concluded*).	4	505	Very precipitous and unworkable ground on the left bank of the Deotal gád.	...	...	...	Has not been valued ...	...	8	...	An useless compartment.
IV.	Kunigád ...	1	750	The whole of the slopes on the right bank of the Kuni gád facing the north-east.	25° to 35°	...	Good, but rarely deep; humus plentiful.	In the lower part a forest of bán with some large and well-grown deodár, rai and kail; higher up chiefly rai and karshu with a few morinda and moru and scattered deodár. The ground is well covered with numerous undershrubs and ringáls are common.	8	8	Not good owing to the dense cover; best in the lower parts.	Selection fellings in 1897. Thinnings in 1894 and 1903.
	"	2	260	Rocky and precipitous ground facing south-west on the left bank of the Kuni gád known here as the Pandáru Tari, as far south as its junction with the Kela Kanora.	...	...	...	Chiefly deodár, with but few other species.	Variable ...	5	Fair, save on the very precipitous parts.	Selection fellings in 1898. Thinnings in 1894 and 1903.
	"	3	245	All the slopes on the right bank of the Kela Kanora facing east and north-east.	25° to 35°	...	Ditto ...	A forest of deodar, rai and moru with a few morinda. The deodár are often of a large size and well grown. Undershrubs are abundant and ringáls plentiful.	8	8	As in compartment 1.	Ditto
	"	4	290	All the slopes on the left bank of the Kela Kanora, and its continuation, the Kuni gád. The ground is very precipitous and for the most part unworkable. General aspect south-west.	Very precipitous.	...	Superficial or more frequently absent, the bare rock being exposed.	Principally deodár, but there are only a few workable pieces which have alone been valued.	Variable, often nil.	4	As in compartment 2.	As in compartment 1.

V.	Dwántigád ...	1	285	The slopes on the right bank of the Dwánti gád, as far north as the Patthiar nali.	Moderate in lower parts; precipitous towards the main ridge.	...	Variable; superficial or absent near the main ridge, good and humus plentiful in lower portion	In the lowest portion a forest of kail, scattered deodár and bán with many blanks probably due to fires, as this appears to be a favorite grazing ground for sheep and goats from Sahlra village. Higher up bán and deodár become more common and kail less so until a fine deodár forest is reached with some rai and a few kail; deodár is plentiful almost up to the main ridge, but there it is of inferior quality.	Kail forest 4 with blanks; bán and deodar forest 7; deodár forest 9.	8 to 10	In kail forest 1, bán and deodár forest 4, and in deodár forest 10.	Selection fellings in 1898. Thinnings in 1895 and 1904.
	" ...	2	370	The upper basin of the Dwánti gád between the Patthiar nali and the Kela Kanora. Chief aspects easterly and south-westerly.	Moderate on eastern slopes frequently precipitous elsewhere.	...	Variable; superficial or absent near the main ridge, good and humus plentiful in lower portion.	On the slopes facing east there is an excellent deodár forest with a few moru near the gád. Deodár is also plentiful on the other slopes associated with a few rai and kail, but it is then of inferior quality.	On slopes facing east 10; elsewhere 8.	On slopes facing east 10; elsewhere 5.	3 to 6	Selection fellings in 1899. Thinnings in 1896 and 1904.
	" ...	3	335	The slopes on the left bank of the Dwánti gád from the Warni to the Sili gád. General aspect westerly.	30° to 40° ...	...	Usually superficial.	A fine deodár forest with very few rai in the higher parts; lower down a very fair forest of kail, deodár and some bán.	9 in deodar forest, 7 in lower portion.	8	...	As in compartment 1
VI.	Siligád ...	1	320	The slopes on the right bank of the Sili gád from its junction with the Dwánti gád to the main ridge. Rocky and precipitous only in higher part and near the gád. General aspect easterly.	Precipitous near main ridge, lower down even, moderate slopes of 25° to 35°, but precipitous bordering on the gád.	...	Good and fairly deep in places with plenty of humus, superficial or absent near the main ridge.	In the lower part a forest of laurels, moru, &c. near the gád, with deodár, rai and kail above, the latter being abundant near the junction of the Dwánti and Sili gáds; higher up a splendid deodar forest, the trees having long clean boles and being often of a large size, whilst mixed with them are a few rai, moru and kail; on approaching the ridge the forest becomes less dense, the predominating species still being deodár with a few rai and moru.	6 to 10	8 to 10	2 to 10 Seedlings being scarcer in the kail forest which has probably been subject to fires.	Selection fellings in 1899. Thinnings in 1896.
	" ..	2	200	The lower part of the eastern half of the basin of the Sili gád. The ground is rocky and a considerable portion is unworkable. General aspect westerly.	Precipitous,	...	Superficial as a rule, but good in places, not unfrequently absent.	In over almost all of the workable ground there is a fine deodár forest with a few rai and morinda, and a little moru near water.	8 to 9	6 to 8	Average 5, but in places 10.	Selection fellings in 1900. Thinnings in 1896, but very little will be required.
	" ..	3	28[illegible]	The upper part of the eastern half of the basin of the Sili gád, containing a good proportion of rocky, precipitous and unworkable ground.	...	...	...	As in the preceding compartment, but the stock is somewhat more open and the deodár more branchy.	7 to 8	6	Ditto ...	As in compartment 1.

APPENDIX C.

Description of Compartments—(continued).

No. of block.	Name of block.	No. of compartment.	Area in acres.	Configuration.	Slopes.	Altitude	Soil.	Stock.	Density.	Quality.	Reproduction.	Treatment.
				SAHLRÁ FOREST—(*concluded*).								
VII.	Jodárgád ..	1—6	1800	Owing to the approach of winter these compartments were not separately described (*vide* description of the block).	...	...	...		...	...	...	Selection fellings in 1900 and 1901; thinnings in 1897.
				NORÁNU FOREST.								
I	Noránu ...	1	255	Contains all the slopes within the forest boundary south of the first large tributary of the Kanoni gád General aspects easterly and north-easterly.	Moderate ...		Good; rich in humus, deep, with the quartzite rock scarcely ever exposed.	Chiefly rai and morinda with deodár and kail on the main ridge and on some of the more prominent spurs. The deodár are knotty and very branchy; mixed with these conifers are moru in the lower and karshu in the upper portion. Undershrubs and ringáls are abundant	Usually 10	4	4	Trees may be sold to purchasers if any come forward
	» ...	2	325	Situated to the north of the preceding compartment as far as the prominent dhar rising from pillar No 6. The compartment is cut up by some tremendous precipices, but there are workable portions.	Often most precipitous.	...	Ditto in ravines, elsewhere superficial, the quartzite standing out prominently, forming the precipices.	A mixed forest of rai, karshu, morinda and deodár, with ringáls and undershrubs.	Variable ...	4	Variable ..	Ditto.
	» ...	3	300	Contains the basin of the large tributary of the Kanoni gád to the east of compartment 2.	Ditto ...	...	Large area with soil as in Noranu 1.	This compartment is better stocked with deodár than any other in the Noránu forest, but owing to a great precipice from pillars 6 to 7 it is almost inaccessible at present except from over the main ridge; an inspection path will have to be made from pillar 5 towards, but above No 6 and thence up the stream.	0 to 8	6	4	Ditto.
	» ...	4	345	Very rocky and almost inaccessible ground east of compartment 3, as far as	Ditto ...	...	...	Has not been described	...	...	...	Ditto.

				the prominent dhar running up from pillar No. 9.									
"	...	5	295	Very rocky and almost inaccessible ground east of the preceding compartment as far as the outer boundary.	Ditto ...	...	...	Ditto ...	...	...	...	Ditto.
						NAINTWÁR FOREST.							
Naintwár	...	1	150	The lower part of the slopes on the left bank of the Kurba gád. Aspect south-westerly.	Usually steep and precipitous, not often less than 40°.	...	Not much soil as a rule.	A forest of deodár and kail mixed with a few moru below and with karshu above; moru with morinda predominates near the gád, where there are also a few rai.	From 8 on the few good slopes to 1 on rocky and precipitous ground.	3	2	Selection fellings in 1903. Thinnings in 1898.
"	...	2	265	The lower part of the slopes on the right bank of the Kurba gád. Aspect north easterly.	35° as a rule, but precipitous in places.	...	Plenty of humus and rock only occasionally exposed.	Usually a good rai and morinda forest with some deodár on the ridges and on the more precipitous slopes, along the main dhar scattered deodar and kail with some rai and a few karshu.	1 to 7	5	3	Ditto.
"	...	3	985	Very rocky and precipitous ground immediately above the village of Kotarbo, workable in many places. Aspect southerly.	Generally 40° or over.	...	Superficial or absent, the quartzite being exposed.	An open forest of deodár, kail and a few rai, with a little moru and buráns. Karshu occurs in the higher parts.	4	4 to 6	2	Ditto.
"	...	4	410	Slopes on the left bank of the Mairi gad except the upper part in the karshu forest. Aspect westerly.	Moderate as a rule, but precipitous in places.	...	Fairly deep, the rock being quartzite or a decomposing shale.	Deodár with rai and morinda, and with moru in the lower and karshu in the upper portion.	7	7 to 8	4	Selection fellings in 1902. Thinnings in 1898.
"	...	5	420	The slopes on the right bank of the Mairi gád from the karshu forest to the large tributary joining the gád at pillar No 15. Aspect south-easterly.	Moderate; nowhere precipitous.	...	Ditto ...	A mixed forest of deodár, kail, morinda and rai with karshu in the higher parts.	6 to 8	6 to 8	2	Ditto.
"	...	6	405	Situated between compartment 5 and the outer forest boundary.	Moderate ...	...	Ditto ...	A deodár and kail forest with very few rai, and some bán and moru near the stream.	3 to 7	6	6	Ditto.
"	...	7	815	Along the main ridge.	...	...	Ditto ..	A karshu and fir forest which has not been valued.	...	...	...	Nothing to be done.
						DÁTMIR FOREST.							
Dátmir	...	1	...	The slopes on the left bank of the Tons included within the forest boundary.	Moderate but precipitous in one or two places.	...	Loamy with plenty of leaf mould	Chiefly stocked with moru, bán, horse-chestnut and rai, a few morinda, fewer deodár and numerous box, which are very knotty and badly grown.	7 to 9	Of box 3...	Of box 4 ...	A small box plantation has been made and some fir trees cut for tea boxes in 1885.

APPENDIX C.

Description of Compartments—(concluded).

Number of block	Name of block.	Number of compartment	Area in acres.	Configuration.	Slope.	Altitude.	Soil.	Stock.	Density.	Quality	Reproduction.	Treatment.
					DATMIR FOREST—(*concluded*).							
	Dátmir ...	2 to 6	...	The slopes on the right bank of the Ions below compartment 7.	Nearly always over 40°, precipices abounding except in the upper portion.	...	Variable but often superficial or absent.	Deodár and kail with a few rai and moru in the lower part, whilst higher up rai, moriuda and karshu become common the moru and kail disappearing. Owing to the precipitous nature of the ground, the dry slippery grass in December and the almost complete absence of all foot-tracks, these compartments were not examined in detail	...	...	On account of fire-protection the grass is very high and in places there is very good reproduction of kail intermixed with a few deodar seedlings.	Selection felling made in 1869-74. Nothing to be done during the present lease.
	" .	7	...	...	Slopes more moderate.	...	...	A forest of karshu and firs, which has not been valued.	...	...	...	To be kept as a grazing ground.

APPENDIX D.

Tables of Contents of Blocks.

(No. of deodár in girth and diameter classes.)

Name of forest.	Number of block.	Name of block.	Area in acres.	I Class over 6′ in girth. Girth classes. Over 12 feet.	12 feet	6 to 9 feet.	Total.	II and III Classes 3′ to 6′ in girth.	Total of I, II and III. Classes.			Remarks
Lambatách,	...	...	2,883	Not valued								Valuation survey
Deota ...	I.	Thadiár ...	576	Not valued								
	II.	Pártil ...	775	289	774	2,083	3,146	2,603	5,749	...	...	
	III	Temple ..	365	290	70[illegible]	2,065	2,967	3,017	5,984	...	...	
	IV	Dopta ...	280	105	564	2,612	3,281	5,147	8,428	...	...	
	V.	Katatách ...	380	15[illegible]	542	2,201	2,894	4,258	7,152	...	...	
	VI.	Jaurási ...	564	193	966	4,348	5,507	6,426	11,933	...	...	
	VII.	Kánga ..	323	123	556	2,511	3,220	3,686	6,906	...	...	
	VIII	Patangni ...	693	406	1,297	4,388	6,091	7,112	13,203	...	...	
	IX.	Kimári ...	420	126	447	1,059	1,632	1,533	3,165	...	...	
	X.	Bhaglár ..	561	not valued								
		Total ...	4,937	1,593	5,848	21,291	28,738	33,782	62,520	...	...	
Bamsu ...	I.	Pipal ...	908	...	...	...	5,635	5,021	10,656	...	...	These numbers include unsound and inaccessible trees.
	II.	Dhikuri ...	701	...	...	...	7,090	6,008	13,098	...	...	
	III	Bamsu ...	714	...	...	...	2,722	1,543	4,265	...	...	
		Total ...	2,323	...	...	...	15,447	12,572	28,019	...	...	
Sarás ...	I.	Dumráli ...	884	...	...	...	4,875	3,293	8,168	...	...	made in 1877-81.
	II.	Kánda ...	350	...	...	...	2,541	1,146	3,687	...	...	
		Total ...	1,234	...	...	...	7,416	4,439	11,855	...	...	
Kotigád	I.	Bálcha ...	480	...	...	...	844	301	1,145	...	...	
	II.	Muánali ...	1,044	...	...	...	1,472	641	2,013	...	...	
	III.	Ola ...	2,444	...	...	...	4,401	2,792	7,193	...	...	
	IV.	Gokal ...	1,295	...	...	...	7,078	4,576	11,654	...	...	Gokal also contains 3-6 erect and 572 dry fallen. I. Class trees as well as 6,799 of the IV class 6″ to 12″ in diameter.
		Total ...	5,263	...	...	...	13,745	8,310	22,055	...	...	
				Diameter Classes. I. Class over 24. Green. sound.	unsound	Dry (sound) erect	fallen	II Class 18″—24″	III Class. 12″—18″	IV Class 6″—12″	Total.	These numbers do not include trees growing on very precipitous and inaccessible places. Valuation survey made in 1885.
Chánsil...	I.	Duchánu ...	260	1,503	15	34	10	470	562	701	3,295	
	II.	Jágta ...	540	2,205	20	68	45	723	1,000	1,627	5,688	
	III.	Dedragád ...	2,355	3,688	131	138	381	1,363	1,489	2,535	9,725	
	IV.	Andrigád ...	1,885	5,098	116	368	266	2,703	3,082	8,020	19,653	
	V.	Boktaragád ...	1,575	3,632	22	131	178	928	1,349	2,334	8,574	
	VI.	Tára Mandal,	4,290	2,257	28	157	114	627	705	1,323	5,211	
	VII.	Maunda ...	900	1,602	3	114	62	358	800	3,417	6,356	
		Total ...	11,805	19,985	335	1,010	1,056	7,172	8,987	19,957	58,509	
Sáhlra ...	I.	Moriru ...	1,645	1 877	3	99	139	796	1,068	4 012	8,021	
	II	Kangugád ...	1,3.5	1,941	27	236	106	894	2,880	13,712	19 796	
	III.	Deotal „ ...	1 310	2,361	416	162	576	13	98	109	3,725	
	IV.	Kuni „ ...	1,545	3,87[illegible]	52	202	270	1,634	1,53[illegible]	2,955	10,523	
	V.	Dwánti „ ...	990	4,786	55	268	318	1,443	1,673	3,956	12,499	
	VI.	Sili „ ..	805	5,240	34	32	585	1,354	1,952	4,504	13,990	
	VII	Judár „ ...	1,800	6,569	84	341	282	2,796	3,052	9,574	22,608	
		Total ...	9,410	26,645	698	1,619	2,276	8,840	12,262	38,822	91,162	
Noránu ...	...	Noránu ...	1,520	8,142	148	430	443	2,675	3,686	8,292	23,810	
Naintwár ...	...	Naintwár ...	3,460	10,459	223	439	396	4,240	5,193	10,916	31,86[illegible]	
Datmir ..	...	Dátmir ...	2,560	4,871	117	168	126	75	2,433	3,934	13,124	

APPENDIX E.

Table of contents of compartments.

Name of forest.	Number of block.	Name of block.	Number of compartment.	Area in acres.	Number of deodar counted (girth classes). I Class. 12′ to 16′	9′ to 12′	6′ to 9′	Total of I class.	II and III Classes 3′ to 6′.	Total of I, II and III Classes.	Remarks.
Lambatách, Dkota ...	I.	Thadiár ...		576	Not valued and not divided into compartments. Ditto	ditto	ditto				These numbers include unsound and inaccessible trees. Valuation survey made in 1877-81.
	II.	Pártil ...	1	165	33	86	127	246	119	365	
	"		2	222	98	302	702	1,102	815	1,917	
	"		3	146	107	249	874	1,230	1,114	2,344	
	"		4	66	30	72	230	332	406	738	
	"		5	73	21	62	143	226	136	362	
	"		6	103	...	3	7	10	13	23	
		Total ...		775	289	774	2,083	3,146	2,603	5,749	
	III.	Temple ...	1	52	28	115	387	530	550	1,080	
			2	79	50	157	339	546	445	991	
			3	49	46	133	399	578	628	1,206	
			4	121	35	218	750	1,003	1,178	2,181	
			5	64	41	79	190	310	216	526	
		Total ...		365	200	702	2,065	2,967	3,017	5,984	
	IV.	Dopta ...	1	122	84	406	1,738	2,228	3,145	5,373	
	"		2	112	5	41	170	216	347	563	
	"		3	46	16	117	704	837	1,655	2,492	
		Total ...		280	105	564	2,612	3,281	5,147	8,428	
	V	Katatách ...	1	92	...	1	3	4	2	6	
	"		2	46	7	12	30	49	15	64	
	"		3	31	14	38	80	132	88	220	
	"		4	47	76	175	449	700	382	1,082	
	"		5	164	54	316	1,639	2,009	3,771	5,780	
		Total ...		380	151	542	2,201	2,894	4,258	7,152	
	VI.	Jaurási ...	1	98	...	3	9	12	17	29	
	"		2	49	13	50	63	126	59	185	
	"		3	77	30	136	672	838	662	1,500	
	"		4	104	69	305	1,575	1,949	2,573	4,522	
	"		5	123	72	391	1,607	2,070	2,271	4,341	
	"		6	113	9	81	422	512	844	1,356	
		Total ...		564	193	966	4,348	5,507	6,426	11,933	
	VII.	Kánga ...	1	74	42	279	1,056	1,377	1,239	2,616	
	"		2	86	5	25	152	182	290	472	
	"		3	68	12	108	724	844	1,640	2,484	
	"		4	64	53	128	566	747	487	1,234	
	"		5	31	11	16	43	70	30	100	
		Total ...		323	123	556	2,541	3,220	3,686	6,906	
	VIII.	Patángni ...	1	118	10	77	189	285	237	522	
	"		2	157	103	514	2,006	2,623	3,097	5,720	
	"		3	218	210	578	1,987	2,775	3,592	6,367	
	"		4	79	74	128	201	403	183	586	
	"		5	121	...	...	5	5	3	8	
		Total ...		693	406	1,297	4,888	6,091	7,112	13,203	
	IX.	Kimári ...	1	122	110	430	1,012	1,552	1,457	3,009	
	"		2	71	16	17	47	80	76	156	
	"		3	227	...	...	...	...	...	...	
		Total ...		420	126	447	1,059	1,632	1,533	3,165	
	X.	Bhagiár ...		561	Not valued and not divided into compartments.						

APPENDIX E.

Table of contents of compartments.—(continued).

Name of forest.	Number of Block.	Name of Block.	Number of compartment.	Area in acres.	Number of deodar counted (girth classes). I Class over 6′ in girth.	II and III Classes 3′ to 6′ in girth.	Total.	Remarks
Bamsu ...	I.	Pipal ...	1	450	3 411	2,315	5,726	Valuation survey made in 1877-81.
			2	134	2,069	2,436	4,505	
			3	197	155	270	425	
			4	127	Not valued.			
		Total ...		908	5,635	5,021	10,656	
	II.	Dhikuri ...	1	269	2,663	1,566	4,229	
			2	314	4,344	4,334	8,678	
			3	118	83	108	191	
		Total ...		701	7,090	6,008	13,098	
	III.	Bamsu ...	1	268	1,550	892	2,442	
			2	198	805	395	1,200	
			3	93	367	256	623	
			4	155	Not valued			
		Total .		714	2,722	1,543	4,265	
Sarás ...	I.	Dumráli ...	1	182	1,554	649	2,203	
			2	222	1,557	1,067	2,624	
			3	103	996	835	1,831	
			4	157	61	75	136	
			5	220	707	667	1,374	This compartment was demarcated in 1885; there are in it also 56 erect and 49 fallen dry and sound first class trees and 770 fourth class trees 6″ to 12″ in diameter.
		Total ...		884	4,875	3,293	8,168	
	II.	Kánda ...	1	160	1,119	351	1,470	These numbers include unsound and inaccessible trees.
			2	190	1,422	795	2,217	
		Total ...		350	2,541	1,146	3,687	
Kotigád...	I.	Bálcha ...	1	300	452	162	614	
			2	180	392	139	531	
		Total ...		480	844	301	1,145	
	II.	Muráli ...	1	154	178	57	235	
			2	148	172	97	269	
			3	145	368	197	565	
			4	220	568	251	819	
			5	175	132	37	169	
			6	202	4	2	6	
		Total ...		1,044	1,422	641	2,063	
	III..	Ola ...	1	103	131	63	194	
			2	202	754	395	1,149	
			3	272	564	321	885	
			4	187	330	277	607	
			5	432	1,385	795	2,180	
			6	309	638	357	995	
			7	939	599	584	1,183	
				2,444	4,401	2,792	7,193	

APPENDIX E.

Table of contents of compartments (No. of deodár in diameter classes)—(continued).

Name of Forest.	Number of block.	Name of block.	Number of compartment.	Area in acres estimated.	I Class over 24″. Green. Sound.	I Class over 24″. Green. Unsound.	I Class over 24″. Dry (sound.) Erect.	I Class over 24″. Dry (sound.) Fallen.	II Class 18″ to 24″	III Class 12″ to 18″	IV Class 6″ to 12″	Total.	Remarks.
KOTIGÁD,	IV.	Gokal ...	1	480	3,254	24	157	112	691	1,130	2,841	8,209	These numbers do not include trees growing on precipitous and inaccessible places. Valuation survey made in 1865.
			2	280	2,304	17	117	147	556	874	2 640	6,655	
			3	320	1,135	25	95	101	547	525	940	3 367	
			4	215	314	5	17	13	122	131	378	980	
		Total ...		1,295	7,007	71	386	372	1,916	2,660	6,799	19,211	
	I.	Duchánu ...	1	260	1,503	15	34	10	470	562	701	3,295	
	II.	Jágta ...	1	320	1,414	16	50	34	438	558	959	3,469	
			2	220	791	4	18	11	285	442	668	2,219	
		Total ...		540	2,205	20	68	45	723	1,000	1,627	5,68°	
	III	Dedragád,	1	110	244	5	13	21	98	111	175	667	
			2	210	443	8	37	104	139	155	342	1,228	
			3	200	359	10	16	8	201	148	327	1,069	
			4	145	662	21	4	6	214	311	550	1,788	
			5	160	75	6	...	2	21	41	46	191	
			6	300	612	10	36	88	219	226	341	1,532	
			7	135	113	7	8	15	35	34	50	262	
			8	120		Not valued							
			6	410	865	59	10	126	360	398	586	2,404	
			10	565	315	5	14	11	56	65	118	584	
		Total ..		2,355	3,688	131	138	381	1,363	1,489	2,535	9,795	
CHÁNSIL	IV.	Andrigád .	1	400	1,562	54	186	93	658	1,322	3,922	7,197	
			2	5 0	1,925	42	107	81	1,087	708	3,035	6,985	
			3	560		Not valued							
			4	425	1,611	20	75	92	958	1,052	1,663	5,471	
		Total ...		1,885	5, 98	116	368	266	2,703	3,082	8,020	19,653	
	V.	Boktáragád	1	175		Not valued							
			2	320	1,713	10	60	73	581	601	1,491	4,729	
			3	840		Not valued							
			4	240	1 919	12	41	105	347	548	843	3,845	
		Total ...		1,575	3 632	22	131	178	928	1,349	2,334	8,574	
	VI.	Tárn Mundal	1	2,800		Not valued							
			2	380	624	6	37	31	303	345	316	1,662	
			3	560		Not valued							
			4	310	*184	*6	*19	*9	*58	*42	*79	*397	
			5	240	1,449	16	101	74	266	318	928	3,152	
		Total ..		4 290	2,257	28	157	114	627	705	1,323	5,211	
	VII.	Maunda ...	1	160	1,490	3	109	57	328	530	1,422	3,945	
			2	4 0	84	...	3	4	13	236	1,869	2,209	
			3	340	28	...	2	1	17	28	126	202	
		Total ..		900	1,602	3	114	62	358	800	3,417	6,356	
SÁULRA ...	I.	Moriru ...	1	495	520	8	29	10	301	376	982	2,232	
			2	200	565	8	24	52	282	394	1,699	3,026	
			3	390	492	8	29	60	137	162	937	1,825	
			4	560	300	6	15	11	76	136	394	938	
		Total ...		1,645	1,877	30	99	139	796	1,068	4,012	8 021	

* These figures are doubtful.

APPENDIX E.

Table of contents of Compartments (No. of deodâr in diameter classes)—(concluded).

Name of forest.	Number of block	Name of block.	Number of compartment.	Area in acres.	I Class over 24, Green. Sound	I Class over 24, Green. Unsound.	I Class over 24, Dry (sound) Erect.	I Class over 24, Dry (sound) Fallen.	II Class 18″ to 24″.	III Class 12″ to 18″.	IV Class 6″ to 12″.	Total.	Remarks.
Sáhlra,	II.	Kángugád ..	1	345	40	...	2	1	55	419	1,600	2,117	Thus number does not include trees growing on very precipitous and inaccessible places. Valuation survey made in 1895.
			2	150	47	...	8	4	38	264	811	1,172	
			3	110	287	2	26	15	166	609	2,942	4,107	
			4	100	344	4	58	39	139	985	5,503	7,072	
			5	180	49	..	1	...	13	23	164	250	
			6	430	1,174	21	81	47	488	580	2,692	5,078	
		Total ...	...	1,315	1,941	27	236	106	894	2,880	13,712	19,796	
	III.	Deotálgád ..	1	240	451	13	81	88	113	350	2,070	3,166	
			2	290	...	...	Not valued						
			3	275	125	...	17	21	39	66	291	559	
			4	505	..	...	Not valued						
		Total ...	...	1,310	576	13	98	109	152	416	2,361	3,725	
	IV.	Kunigád ..	1	750	972	9	71	122	505	353	528	2,560	
			2	260	1,007	21	18	29	378	377	691	2,521	
			3	245	549	4	51	78	93	103	363	1,241	
			4	290	1,343	18	62	41	658	706	1,373	4,201	
		Total ...	...	1,545	3,871	52	202	270	1,634	1,539	2,955	10,523	
	V.	Dwántigád,	1	285	1,769	9	106	141	491	482	1,957	4,955	
			2	370	1,274	6	54	54	415	597	1,060	3,460	
			3	335	1,743	40	108	123	537	594	939	4,084	
		Total ...	...	990	4,786	55	268	318	1,443	1,673	3,956	12,499	
	VI.	Siligád ...	1	320	2,640	20	124	317	782	1,147	1,773	6,803	
			2	200	1,726	11	131	160	440	578	2,342	5,388	
			3	285	874	3	66	108	132	227	389	1,799	
		Total ...	...	805	5,240	34	321	585	1,354	1,952	4,504	13,990	
	VII.	Jodárgád ..	1	500	2,693	38	97	128	1,252	1,215	2,194	7,617	
			2	190	1,039	13	26	33	623	514	433	2,681	
			3	500	774	2	82	34	262	228	493	1,875	
			4	220	973	17	66	37	247	378	1,870	3,588	
			5	2 5	812	9	51	40	217	603	4 276	6,008	
			6	115	278	5	19	10	105	114	308	839	
		Total ...	...	1,800	6,569	84	341	282	2,706	3,052	9,574	22,608	
Noránu ...	...	Noránu .	1	255	693	9	40	26	280	381	1,201	2,630	
			2	325	484	30	31	23	182	302	513	1,565	
			3	300	4,318	74	245	285	1,626	2,199	3,859	12,599	
			4	345	1,722	17	80	75	446	462	1,266	4,068	
			5	295	945	12	34	34	141	342	1,460	2,948	
		Total ...	...	1,520	8,142	142	430	443	2,675	3,686	8,292	23,810	
Naintwár	...	Naintwár ...	1	150	244	4	7	16	111	108	267	757	
			2	265	627	12	26	16	210	285	743	1,919	
			3	985	2,990	80	108	89	1,274	1,711	2 939	9,191	
			4	410	2,074	69	163	141	788	1,153	3,732	8,120	
			5	420	1,867	14	93	73	684	638	1,345	4,714	
			6	405	2,657	44	42	61	1,173	1,298	1,890	7,165	
			7	8 5		...	Not valued						
		Total ...	..	3,400	10,459	223	439	396	4,240	5,193	10,916	31,866	
Dátmir ...	..	Datmir ...	1	430	5	...	...	...	3	19	35	62	
			2	3 0	2,091	66	70	39	858	1,111	2,003	6,238	
			3	430	329	7	9	6	135	179	258	923	
			4	220	1,259	27	45	42	338	465	555	2,731	
			5	210	487	14	15	14	148	214	319	1,211	
			6	200	700	3	29	25	298	445	764	2,259	
			7	700	...	...	Not valued						
		Total ...	...	2,560	4,871	117	168	126	1,778	2,433	3,934	13,424	

APPENDIX F.

RIVER RULES.

(*Extracts from G. O. No.* 300 *of* 28*th February*, 1880, 1004 *of* 2*nd November*, 1880 *and from No.* $\frac{410-F}{129-10}$, *of* 26*th June*, 1885)

No. 300.—In accordance with the provisions of section 45 of the Indian Forest Act, VII of 1878, the Hon'ble the Lieutenant-Governor, North-Western Provinces, and Chief Commissioner, Oudh, is pleased to direct that the following shall be the areas within which all unmarked wood and timber shall be deemed the property of Government, unless and until any person establishes his right and title thereto:—

(*a*) All reserved and protected forests in the North-Western Provinces and Oudh.

(*b*) The Jumna and its tributaries in British territory above the Scinde, Panjáb, and Delhi Railway bridge at Rajghát, including an area of three miles from either bank of the main stream of the Jumna river, taking that stream at its cold season level

(c-f.) other streams follow not connected with the Jaunsár Division.

The Lieutenant-Governor and Chief Commissioner is further pleased to exempt from the provisions of section 45 of the Indian Forest Act, 1878, all head-loads of drift, timber of every description; the pieces not to exceed 6′ in length or 2′ in girth.

No. 1004.—Under section 41, Act VII of 1878 (the Indian Forest Act), the Lieutenant-Governor of the North Western Provinces and Chief Commisioner of Oudh has made, and with the sanction of the Governor-General in Council is pleased to publish, the following rules for the reserved and protected forests in the North-Western Provinces and Oudh:—

(1) All words used in these rules and defined in Act VII of 1878 (the Indian Forest Act) shall be deemed to have the meaning respectively attributed to them by the said Act.

2-5 I.—Transport by land (details omitted here).

Launching and collection of timber.

6. II.—*Transport by river.*—No person having launched his timber, or set it afloat on any river, shall collect the same, except—

(*a*) With the permission in writing of the Forest Officer in charge of the Forest Division.

(*b*) At places where such officer shall notify as catching depôts.

Pass for rafting timber.

7. No person shall raft or otherwise convey any timber which has been collected on any river without first obtaining a pass from the Forest Officer in charge of the Forest Division in which the river is situated, or from such subordinate officer as the officer in charge of the Forest Division may authorize on that behalf. Such pass shall show the number of logs or pieces, the kind of timber, the marks indicative of the owner's property therein, the place of its destination, and the time for which it shall remain in force. It may specify that the timber may be stopped in certain places to be named in the pass.

No pass to be issued for timber unmarked or bearing an unregistered mark.

8. No pass shall be issued for any unmarked timber, or for such timber as bears a mark not registered as hereinafter provided.

Detention of timber in default of production of pass.

9. Any Forest Officer may require any person rafting or conveying timber as aforesaid, to produce the pass for the same at any time. No person shall be entitled to raft or convey timber by virtue of a pass which he does not himself hold, but which is, or is stated to be, in the hands of some other person. In the event of the pass not being produced, the Forest Officer may detain the timber.

10. For issue of the pass a fee not not exceeding one anna for each log or piece of timber may be levied on such river, and at such places, as the Conservator of Forests may from time to time direct.

Fee for issue of pass.

11. All persons wishing to float or otherwise convey timber by any river shall register, at the office of the Forest Division to which the control of the river pertains, the mark which indicates the proprietary right in the timber. A fee of Rs. 5 shall be payable for such registration. Not more than one mark shall be registered for each owner.

Registration.

12. No person shall be allowed to register a mark already registered in favour of another person, nor any mark used by Government; and the Forest Officer may refuse the registration of any mark which in his judgement so closely resembles a mark used by Government or registered in favour of any person as to be easily producible by altering such marks.

Refusal to register certain marks.

13. Every registration under these rules shall hold good for three years, following the 1st of January next after the date of registration.

Registration to hold good for three years.

A certificate showing the mark registered, the date of registration, the period for which it holds good and acknowledging the payment of the fee, shall be given to every person registering his mark.

Certificate of registration.

14. Within the limits of any area notified under section 45, the converting, cutting, burning, concealing, or marking of timber, the altering or effacing of any marks on the same, and the possession or carrying of marking hammers or other implements used for the marking of timber, except with the permission in writing of the Forest Officer, is prohibited. Such permission, if granted, shall specify the place at which only it is to take effect, and may contain such other conditions regarding the previous inspection of the timber and otherwise as may be necessary.

15. III. *General.*—Any person who infringes any of these rules shall be liable to imprisonment of either description for a term which may extend to six months, or to fine which may extend to five hundred rupees or to both.

Penalty.

APPENDIX G.

NOTICE.

THE following arrangements are made by the Conservator of Forests, School Circle, North-Western Provinces, for the transport of timber on the river Jumna. They have reference to Section II. of Government Notification No. 1004, Revenue (Forests) Department, dated 2nd November, 1880:—

[See paras. 11, 12 and 13 of Notification.]

1. *Property mark*—Any person wishing to use the river for floating his timber must register his property mark in the office of the Tons (now Jaunsar) Forest Division. He will obtain a certified extract from the register book, on payment of a registration fee of Rs 5. No. more than one mark can be registered for each owner. Application to register a mark may be made either personally or by letter to the Officer in charge of the Tons Forest Division The registration holds good for three years following the 1st January next after the date of registration.

[See para. 6 (a) of the Notification.]

2. *Collection of timber.*—At least one month before the timber is launched, the owner must apply to the Officer in charge of the Tons Forest Division for permission to collect it. The application must be in writing, and must contain the following information, *viz.*:—

(1) Name and address of owner.

(2) His father's name.

(3) Description of the timber, including the number and dimensions of the pieces.

(4) Property mark which it bears.

(5) The period within which the timber is to reach Dághpathar.

[See para 6 (b) of the Notification.]

On receipt of this application the Officer in charge of the Tons Forest Division will issue a "collecting pass" free of charge. Government maintains a boom and an establishment at Dághpathar between 1st December and 31st May for the purpose of collecting all timber which comes down to that place. During the remainder of the year Government maintains an establishment to catch timber at the undermentioned "catching depôts," *viz.*:—

Dághpathar.
Gangbewa.
Rampur Mandi.
Fyzabad.

[See para. 6 (b) of the Notification.]

The establishment maintained by Government does its best to catch all timber between Dághpathar and Fyzabad, both places inclusive; but Government is not responsible for any timber which the establishment may fail to catch. Subject to this condition, *viz.*, that the boom at Dághpathar cannot be interfered with, nothing hereinstated prevents the owners of timber from collecting their own timber at any of the places above named.

For all timber caught for its owner under this arrangement, fees at the following rates will be charged on broad and metre gauge sleepers and karis of all kinds, *viz.*:—

Name of catching depôt.	From 1st December to 31st May.		For the rest of the year.	
	Broad gauge sleepers.	Metre gauge sleepers and karis.	Broad gauge sleepers.	Metre gauge sleepers and karis.
Dághpathar	4 pies.	3 pies.	1 anna.	9 pies.
Gangbewa	4 "	3 "	1 "	9 "
Rampur Mandi	4 "	3 "	1 "	9 "
Fyzabad	2 annas.	1½ annas.	2 annas.	1½ annas.

These fees, which may be paid either at Dághpathar or into the tahsíl at Kálsi, are levied in consideration of the work done for the owners in catching their sleepers for them.

3. *Stacking ground.*—Government provides a stacking-ground at each catching depôt, and permits the owners of timber in transit on the river to use these grounds free of charge.

4. *Rafting of timber.*—No person can raft or otherwise convey any timber which has been collected on the river without first obtaining a "rafting pass" from the Officer in charge of the floating operations. Rafting passes will be issued at Dághpathar. Applications for rafting passes must be accompanied by the following information, *viz.* :— [See para. 7 of the Notification.]

(1) Name and address of owner.

(2) His father's name.

(3) Description of the timber, including the number and dimensions of the pieces.

(4) Property mark which it bears.

(5) The period within which the timber is to reach Bogriwala (for the Western Jumna Canal) or Fyzabad (Eastern Jumna Canal).

The following raftage fees are payable for all timber rafted under the provisions of this memorandum, *viz.* :— [See para. 10 of the Notification.]

Logs or beams over 10 feet in length (deodár)	...	6	pies each.
Ditto ditto (other timber)		4	,,
Broad gauge sleepers (deodár)	...	... 5	,,
Ditto ditto (other timber)	...	... 3	,,
Metre gauge sleepers (deodár)	...	... 3	,,
Ditto ditto (other timber)	...	... 2	,,
Sál and other karis	...	... 2	,,
Other pieces	...	... 1	,,

[No 97 of 12th November, 1883, to Tons Division.]
[No 126 of 15th November, 1883, to Government.]
With additions for "deodár" and "other timber."

These fees, which may be paid either at Dághpathar or into the tahsíl at Kálsi, are levied in consideration of the security afforded to the timber while in transit, the maintenance of the path down the river-bank, and the provision of free depôts. At present a rafting pass is not required to accompany each raft. Rafting passes may be issued to cover such maximum quantities of timber as the Officer in charge of the Tons Forest Division may from time to time prescribe. The passes are retained at the examination depôts, where the quantities of timber actually passed out under them are marked on their reverse and also registered in a book.

5. *Consolidated collecting and rafting fee.*—For sleepers caught during the period between the 1st December and 31st May at Daghpathar, Gangbewa or Rampur Mandi, a consolidated fee is levied as follows, *viz.* :—

Broad-gauge sleepers (deodár)	...	9	pies each.
Ditto ditto (other timber)	...	7	,,
Metre-gauge sleepers (deodár)	...	6	,,
Ditto ditto (other timber)	...	5	,,
Karis of all kinds ...	...	5	,,

[No. 97 of 12th November, 1883, to Tons Division.]
[No. 126 of 15th November, 1883, to Government.]
With additions for "deodár" and "other timber."

6. *Examination depôts.*—Examination depôts are established at the following places, *viz* :— [See para. 9 of the Notification.]

Bogriwála—for timber going down the Western Jumna Canal.

Fyzabad—for timber going down the Eastern Jumna Canal.

The rafting passes are retained here and dealt with as previously described (see paragraph 4). When the timber noted in any rafting pass has been exported, or when the time for which it holds good has expired, the pass is sent by the Forester at the examination depôt with his report to Dághpathar. Permission to take down

more than 100 pieces in excess of the number mentioned in the pass will not be given without the production of a fresh pass. Excess quantities within this limit may be taken down on payment at the examination depôt of the prescribed fees.

7. *Certain descriptions of timber deemed to be the property of Government.*—Under section 45 of the Forest Act and Notification No. 300 of the 28th February, 1880, timber of the undermentioned description is deemed to be the property of Government, unless or until any person establishes his right and title thereto, *viz.:*—All timber found adrift, beached, stranded or sunk; all wood bearing marks which have not been registered or on which the marks have been obliterated, altered or defaced by fire or otherwise; and above the railway bridge at Rajghát, within a direct distance of three miles from either bank of the main stream, all unmarked wood and timber. But this does not apply to timber outside the reserved forests excepting to pieces of sál, sissu, deodar and tún timber exceeding two feet in girth and four feet in length. The abovementioned catching depôts are also depôts for the reception of drift timber: they are:—

Dúghpathar.
Gangbowa.
Rampur Mandi.
Fyzabad.

The following is the procedure to be observed in respect of all timber of the abovementioned description:—

[Section 45, Forest Act.]

(*a*) The Forest Department will collect it and take it to one or other of the depôts abovementioned.

[Section 46, Forest Act.]

(*b*) The Officer in charge of the Tons Forest Division will, from time to time, publicly notify a description of it, and require all claimants to present their claims in writing within a period of two months.

[Sections 47 and 48 of Act.]

(*c*) If no claim is presented within two months, or if a claimant whose claim has been rejected omits within a further period of two months to institute a suit for the recovery of possession of the timber, the timber will become the proper of Government.

[See para. 14 of Notification.]

8. *Converting, cutting, burning, concealing or marking of timber.*—Above the railway bridge at Rajghát, and within a direct distance of three miles on either side of the main stream, the converting, cutting, burning, concealing or marking of timber, the altering of any marks on the same, and the possession or carrying of marking hammers or other implements used for the marking of timber, except with the permission, in writing, of the Officer in charge of the Tons Forest Division, is prohibited.

APPENDIX H.

The Western Jumna Canal Rules for the Measurement of Rafts.

1. Rafts composed partly of squared and partly of round timber, or of logs of very unequal sizes will not be allowed to enter the canal.

2. All rafts after being made up will be moved to the right bank in the first mile of the canal, where they will be measured, and after issue of rawannahs and payment of dues will be passed down the canal.

3. No raft to measure more than 18 feet across, that is, in a direction at right angles to that in which the rafts will float.

4. The contents of log rafts will be calculated as follows :—

Contents.—$\frac{2}{3}$rds of length × breadth × depth.

By length is to be understood the dimension of the raft in the direction of the logs, the average length of which, as judged by the eye, is to be taken.

The breadth is the dimension measured across the logs, from outside to outside. The depth will be formed by dividing the breadth by the number of logs. When rafts are composed of logs of very different length they may be measured in two or more parts, the contents of each part being taken out separately and added together for the contents of the whole raft.

5. Bamboo lashings on log rafts to be measured as follows :—

Contents.—Number of bundles × length of a bundle × $\frac{2}{27}$ of the square of its girth.

If the length or girths of the bundles vary considerably, the contents of the bundles to be taken out separately.

6. *Bamboo rafts.*—The contents to be measured in the same way as directed for log rafts, each bundle being regarded as a log.

7. *Rafts of sleepers or squared timber.*—The contents of a sleeper or squared timber raft, exclusive of lashings, will be calculated as follows :—

Contents.—Length × breadth × depth.

The contents may be taken out in parts when necessary, the contents of the whole raft being the sum of the parts. The sleepers used as lashings will be counted and the contents of the lashings found by multiplying the number by the measured contents of one sleeper. The number used as lashings will be always noted in the rawannah.

8. *Karis and other small scantling*, if tied in bundles, will be measured in the same way as bamboo rafts. If laid side by side the contents of the rafts and lashings to be measured in the same way as sleeper rafts

9. Ballah rafts will be measured in the same way as logs rafts.

10. *Grass, sirkanda and firewood.*—The contents will be the product of the actual length, breadth and depth as measured.

11. When rafts of any kind are composed of two or more courses, the measurements will be made separately for each course, in accordance with foregoing instructions, the total contents being the sum of those of the separate courses.

APPENDIX I.

Yield in metre gauge sleepers of sample trees in the Deota Forest.

Block.	Number of trees.	Girth of trees.	Length of workable stem.	Cubic contents of workable stem.	Cubic contents of trees.	Total cubic contents of remainder	Outturn in sleepers. Accepted No.	Rejected No.	Accepted cubic contents.	Rejected cubic contents.	Percentage of total cubic contents utilized.	Remarks.
		Ft.	Feet.		c. ft.	c. ft.			c. ft.	c. ft.		
Dopta and Temple ...	2	5	?	33	59	92	20½	...	33	...	36	
Ditto	2	6	?	69	91	160	16	...	24	...	15	
Katatách	3	6	?	104	76	180	44	...	66	...	37	
Ditto	1	6	44	74	75	149	45	...	70	...	47	
Jaurási	1	6	56	139	81	219	46	...	72	...	32	
Average for 6′ trees ...	...	...	55	96½	80½	177	38	...	58	...	32	
Dopta and Temple ...	2	7	?	96	78	174	38	...	57	...	32	
Katatách	7	7	?	154	94	248	71	...	106	...	43	
Jaurási	6	7	60	144	122	266	49	1·3	77	2	29	
Average for 7′ trees ...	...	...	60	131	98	229	52	·4	80	⅔	35	
Dopta and Temple ...	1	8	?	133	84	217	61	...	91	...	42	
Katatách	11	8	?	176	115	291	79	...	119	...	41	
Ditto	2	8	62	167	105	266	65	3	102	5	38	
Jaurási	7	8	59	177	150	327	73	·7	113	1	35	
Average for 8′ trees ...	...	...	60	163	113	276	70	...	106	1½	38	
Dopta and Temple ...	2	9	?	170	63	233	93½	...	139	...	60	
Katatách	15	9	?	200	145	345	85	...	128	...	37	
Ditto	1	9	81	215	109	324	122	2	190	3	58	
Jaurási	3	9	61	242	193	435	84	2½	132	4½	30	
Average for 9′ trees ...	...	...	71	207	127	334	96	1	147	2	44	
Dopta and Temple ...	1	10	?	213	157	370	91	...	135	...	37	
Katatách	2	10	81	322	259	581	94	3½	147	5½	25	
Jaurási	2	10	87	300	212	512	110	1	172	1½	34	
Average for 10′ trees,	...	...	84	278	209	487	98	1	151	2½	31	
Katatách	2	11	97	349	137	486	144	7	225	11	45	
Jaurási	3	11	58	302	285	587	108	6	168	9	29	
Average for 11′ trees	...	...	77	325	211	536	126	6½	196	10	36	
Dopta and Temple ..	1	12	?	411	211	622	206	...	306	...	50	
Katatách	2	12	100	467	83	550	193½	10	302	15½	55	
Average for 12′ trees	...	...	100	439	147	586	200	5	302	8	52	
Katatách	1	...	69	453	118	571	205½	14	321	22	56	
Katatách	1	...	91	541	187	728	227	10½	354	16	49	
Jaurási	1	...	88	885	388	1,273	255	4	398	6	30	
Average for 14′ trees,	...	...	90	713	287	1,000	241	7	376	11	37	
Katatách	1	...	94	969	224	1,193	326	25	504	39	42	
Ditto	1	...	68	518	347	865	290	18	452	28	52	62′ of the stem was damaged.

Note by the Assistant Inspector-General of Forests and Superintendent of Working-Plans on Mr. Hearle's Working-Plan for the Tehri-Garhwal Leased Forests.

THE summary of this Plan, submitted by the Conservator of the School Circle, under cover of his No. 296, dated the 19th November 1887, is sufficiently exhaustive to render any very elaborate description of its object and provisions superfluous.

2. The first six chapters of Mr. Hearle's work relate to such general matters as are necessary to a proper comprehension of local conditions, and contain, in this connection, a great variety of useful, as also necessary, information admirably arranged.

Chapter VII includes the Working-Plan proper, and Chapter VIII the financial forecast constructed on the same. A number of appendices and maps and plans follow, bearing on matters contained in the Report.

3. This Working-Plan is intended to regulate the working of the Deodar tracts leased to us by the Rajah of Tehri-Garhwal for the period commencing with the 1st April 1885 and ending with the 31st March 1905, and, as such, is made to embrace the period of that lease only, namely, 20 years.

4. The area of these leased forests is 45,198 acres, of which only 29,660 acres are said to be Deodar-producing; and the Plan relates *to this one species only*, and to the working and management of the forests in its exclusive interest; the other species met with having no present market value, or being likely to have any within the period of the lease.

5. Later on, it is probable that these leased forests—since the British Government has the right to renew the lease—will be comprised, with certain neighbouring forests, in one Working-Circle, and be rendered subject to a more comprehensive and permanent Working-Plan. In his introduction, Mr. Hearle observes in this connection:—"The present Plan, when it prescribes that the Tehri leased forests shall be worked through in 20 years, regards them as forming a portion only of a large Working-Circle, the precise composition of which cannot be determined until the remaining Deodar forests in the Jaunsár Division have been valued. In fact, there seems no good reason for treating them apart from the other forests, as the British Government has the right to renew the lease for a further term at the expiry of the present lease in 1905."

6. This Plan, therefore, mainly aims at regulating the extraction of Deodar from a given area during a short term of years, and in such a way as to give us the largest profits compatible with our responsible position of lessees *of the annual yield only*, and of temporary guardians entrusted with the office of combining our working with such improvements as appear to be called for.

7. The valuation survey for these leased forests shows:—

I	class Deodar (6′ girth and over)	...	...	137,000 trees.
II	„ „ (4′ 6″—6′)	...	...	50,000 „

But Mr. Hearle gives 46,000 I class sound green trees as being alone *available* during the remaining 17 years of the lease, and 12,000 of these he places in reserve, as being situated in localities difficult to work with much chance of profit.

His proposal is, therefore, to work out 34,000 I class sound green Deodar, at the rate of 2,000 trees per annum during the 17 remaining years of the lease; indenting on the reserve of 12,000 in case the resources of these forests have been over-estimated.

8. But, besides the 2,000 I class trees which Mr. Hearle proposes to fell as above, he would include in the year's fellings all dry standing and all fallen timber. It may be safely urged, therefore, that he will fell 36,000 I class

trees during the 17 years, and that exclusive of existing dry material. In other words, he will be forced on to his reserve in any case. But, of course, there is just as much chance that his resources have *been under-estimated.* This estimate of available material must, by its nature, be *exceedingly rough*, excluding as it does all trees growing on inaccessible ground, and, *it is presumed*, all trees that, from the character of the surrounding growth, cannot be removed during the next 17 years. *Mr. Hearle goes into no explanations, however, on this very important point.*

9. Assuming the estimates to be accurate, we should have, by the end of the lease, the following I class trees on the ground :—

(*a*) 101,000 trees that are already I class, but reported to be now unexploitable—but from what causes, *it is not said.*

(*b*) Some 25,000 trees now belonging to the II class. But, here again, it is impossible for us to understand from the Report whether the present II class trees include, in all cases, accessible trees only.

In the case of a very considerable portion of the survey, ALL trees were taken into account, *however situated ;* while, over the rest of the ground, no trees were considered that grew in localities difficult of access.

10. Let it also be observed that, by the end of the lease, the untouched (*i.e.*, untouched for the next 17 years) forests of Lambatach and Dátmir, aggregating 5,443 acres, should furnish a considerable quota of 1 class trees.

On the whole, it would seem, *from the data before us*, that the proposed fellings are on an *exceedingly* moderate scale.

11. But bearing in mind the difficulties and disadvantages connected with the working of the tracts placed by Mr. Hearle in reserve—see paragraph 120, page 36, of his Report—it is questionable whether we should not insist on a rigid adherence to the plan of operations given by him in paragraph 119. Mr. Hearle deprecates this course; but I think the safe principle will be to insist upon it; at least to this extent that the area worked over each five years shall not exceed the area given for that period in the plan of operations, and shall comprise the same tracts. Unless this be done, we may find ourselves forced on to the reserve supply at an early stage, and then unable to work it. I think it inadvisable to place too much reliance on a store that Mr. Hearle does not appear to be at all sure of profitably working. If a five-year block, as above, should be found to contain a six, seven, or eight years' supply, there will, on the other hand, be no objection to its removal within the period corresponding (6, 7, 8 years).

12. I have nothing further to say on the subject of this Plan, the provision of which may, I think, in other respects be accepted. It will be noticed that, although the Deodar trees in these forests attain to the enormous dimensions of 9 feet in girth, without deteriorating, Mr. Hearle proposes to fell all trees over 6 feet in girth, with the exception of apparently growing trees only just over that limit. Generally speaking, this would be a great mistake; but we are forced to this end in the present instance by the peculiar circumstances of the case, the principal characteristic of which is the necessity of constructing very costly and *non-movable* export-works, which can only realize a profitable return so long as the fellings are concentrated in a very great degree; in other words, so long as we do not spread our operations in the manner which the selection of a maximum development of material only would necessitate.

E. P. D.,—6-7-88.

Before this Plan is passed, it must be explained what is meant by estimate of sound green trees available. There are apparently 137,000 I class trees, but only 16,000 available during the next 17 years. Why is the large balance unavailable ?

I agree in the Assistant Inspector General's Note.

B. R.,—7-7-88.

Tehri Plan.—I should have inserted a paragraph about non-exploitable I class trees. From paragraph 110, it will be seen that in the Deota, Bamsa,

Sarás, and Kotigád forests, every I class tree was counted, whether growing on workable or unworkable ground, and whether fit for timber or the reverse; whilst in the remaining forests, all trees were counted except those growing on precipitous, unworkable, ground.

In these Deodar forests, as I believe in most others (*vide* paragraph 76 of Mr. D'Arcy's Plan for the Upper Ravi Leased Forests), there is a large percentage of I class trees unfit for timber, and their proportion to the others I have estimated mainly from the results of the past fellings at Deota, and from the general quality of the trees in the other forests and the nature of the ground.

Omitting the forests which have been worked over, and which I do not consider will be fit for re-working before the end of the lease in 1905, we have a total of 114,180 I class trees, and, out of these, 48,878, according to paragraph 116, were available for felling, which leaves a balance of 65,302 to be accounted for. I believe at least 50 per cent. of the total number of trees to be unavailable, either because they are found on precipitous unworkable ground, or are very branchy and unfit for timber, or are overmature and unsound. The number of these trees would, therefore, be 57,090, still leaving a small balance of 8,212, and these may have to be left for sylvicultural reasons. From paragraph 119, it will be seen that the number of trees to be worked out from each block is not rigorously fixed, entire discretion in the selection of trees being left to the Divisional Officer. If, therefore, in the course of a few years it be found that the forests are not being worked over so rapidly as anticipated in this paragraph, the Conservator can easily apply for sanction to have the Plan modified in accordance with the further experience gained in working the forests; but for the present I would not advise annually more than 2,000 being felled departmentally, and from 700 to 800 sold standing from the forests in reserve mentioned in paragraph 120.

N. HEARLE,

Deputy Conservator of Forests.

CHAKRATA,

16th July 1888.